FOUNDRY
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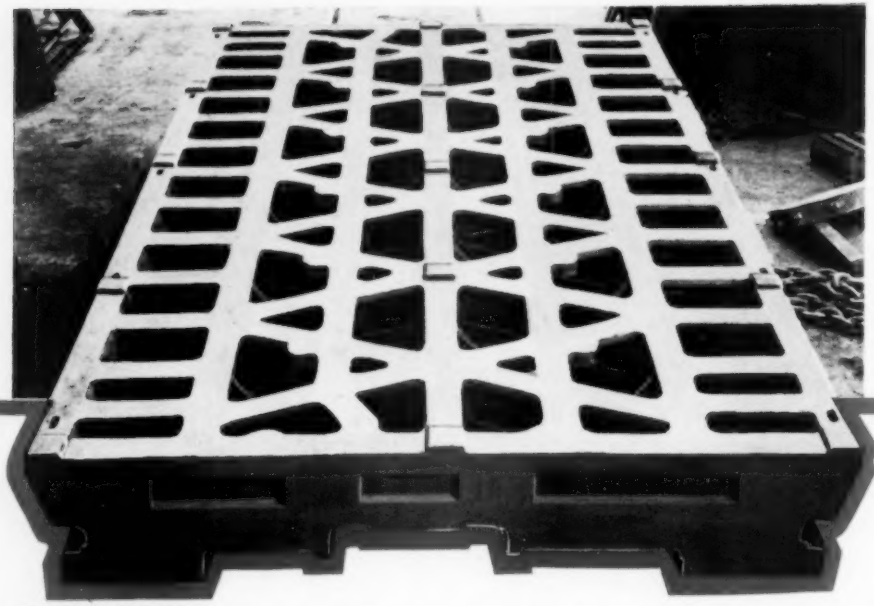


COROVIT SLASHES COREMAKING COSTS

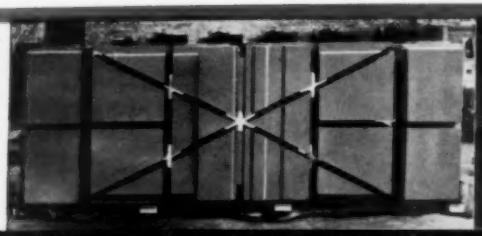
at George Richards' Foundry

The coremaking time for the above 14 ton bed casting (19′ x 9½′ x 1¾′) for a horizontal boring machine was cut from 300 hours to 129 hours by using the Corovit cold setting technique. Further savings were made in decoring and fettling times, because Corovit cores reproduce accurately the dimensions of the corebox. And, of course, Corovit gives an improved finish, substantially reducing subsequent machining.

COROVIT is manufactured and sold in the U.K. solely by FORDATH, who prepay licence fees to Reichold Chemie A.G. of Switzerland. Reichold are the proprietors of British Patents 653,530 & 761,035. Thus foundries using COROVIT are automatically free from liability to suit for infringement of these patents when they use peroxide-group accelerators in their cold-setting work.

ASK **FORDATH** TO TELL YOU ABOUT **COROVIT** COLD-SETTING TECHNIQUE

Photographs by kind permission of George Richards & Co. Ltd., Broadheath, Altrincham, Cheshire.



Above: One of the six 30 cwt. cores used in making the 14 ton casting. Each core measured 8′ x 3′ x 1′.

Above: Unstoved cold-set Corovit cores being lifted from the corebox in the green state.

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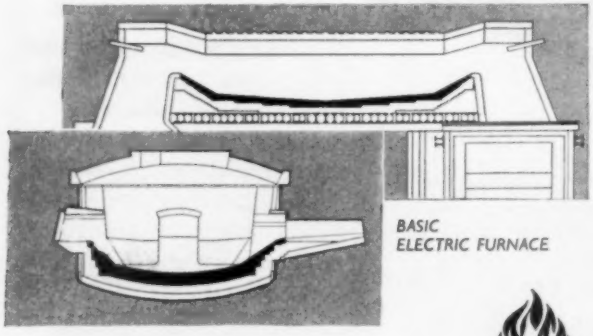

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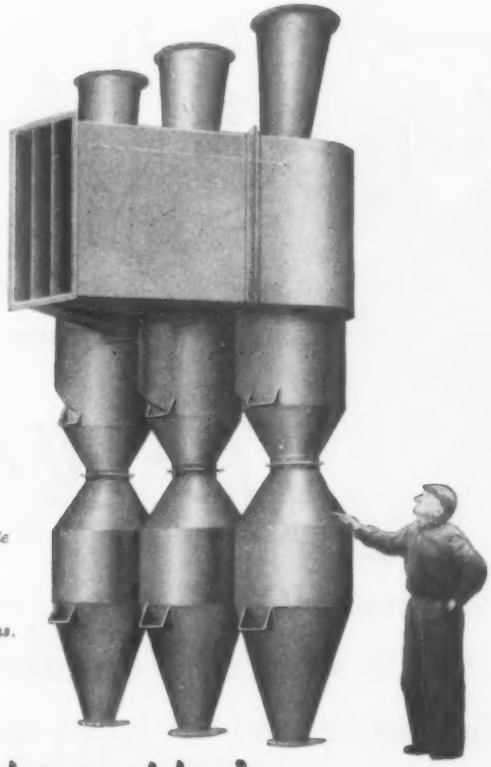

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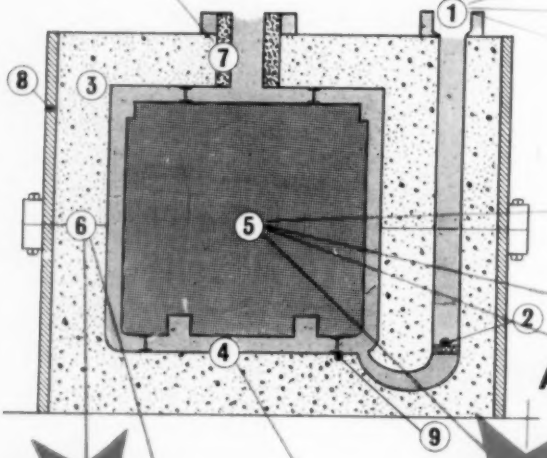

Key to Sectional Drawing of Mould

		Send for booklet No.
1	Metallurgical Control use of Fluxes	3
2	Clean Metal by using Ceramic Strainer Cores and Discs.	4
3	Coal Dust additional to Facing and Backing Sand	1
4	Silverskin Blackings, Plumbago and Mould Dressings.	1
5	Cores using Crulin and Crudol Core Binders (Oil Bonded, Air Setting Cereal or CO.2 Binders).	2
6	Moulds Parted with Beecro Silica Free Parting Powder or Beecrol Parting Liquid.	1
7	Casting Feeding with Alsica Exothermic Feeder Heads.	4
8	Moulding Boxes supplied by B.F.U. }	5
9	Chaplets, Studs, etc. }	

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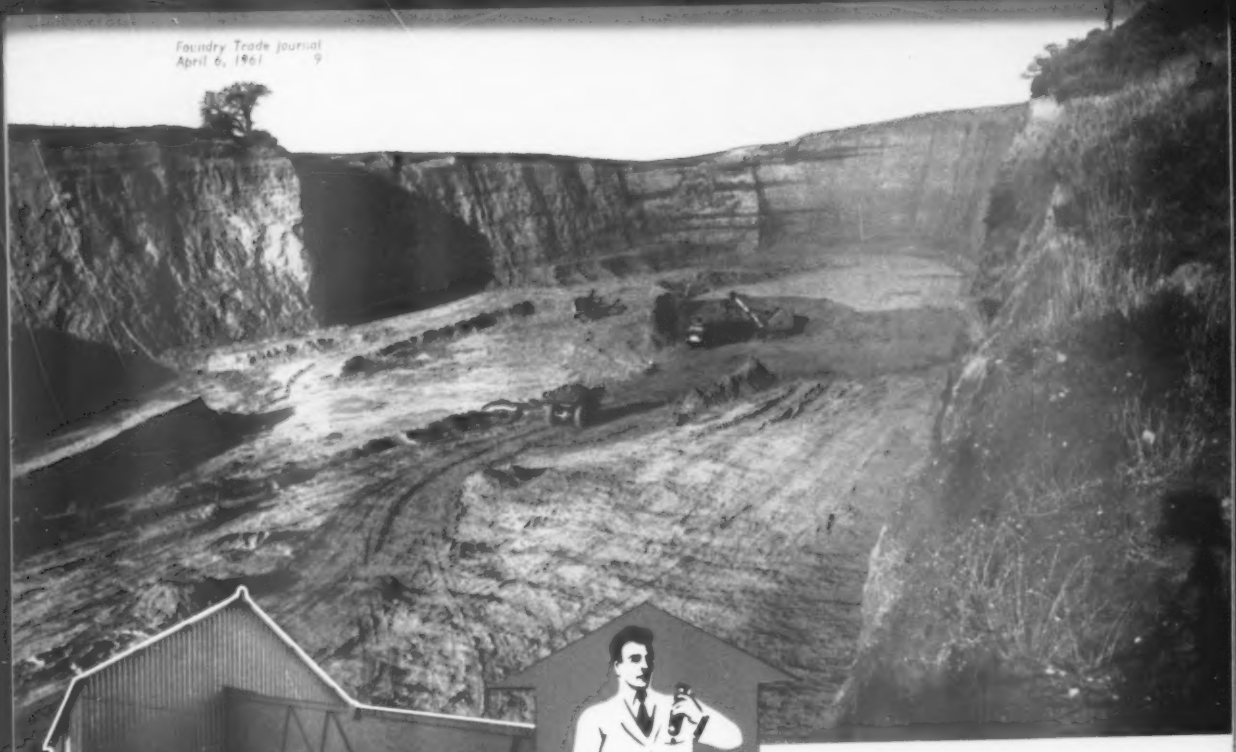

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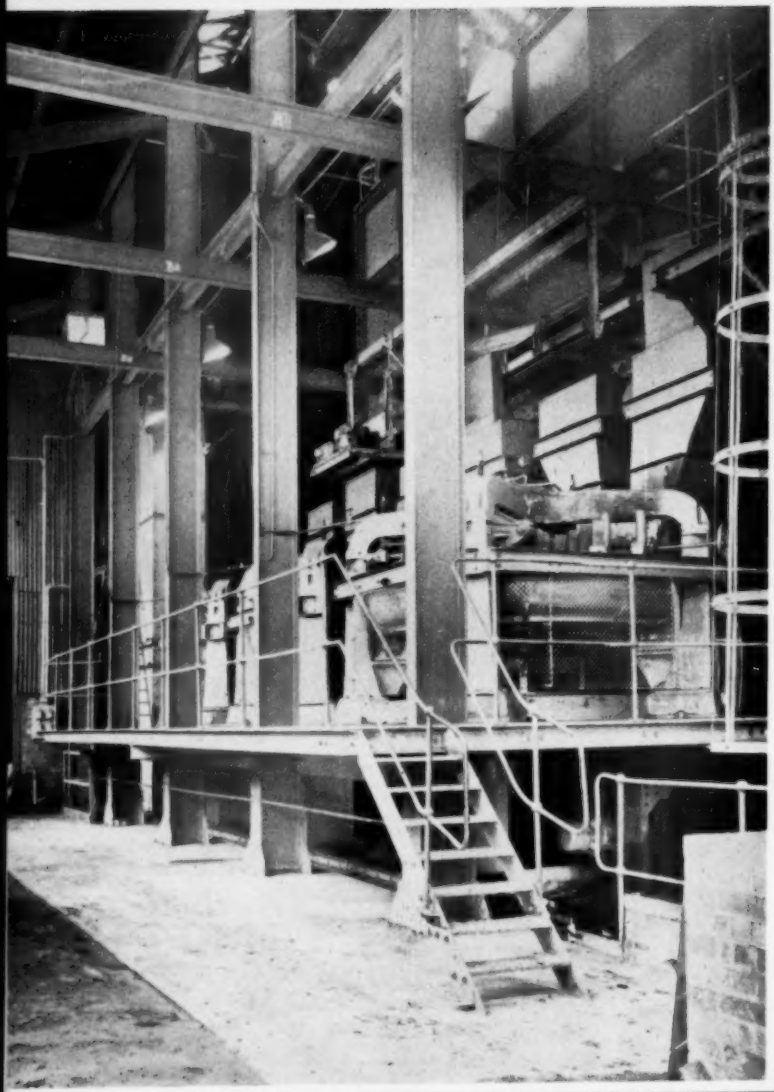

Three S.B.3 Continuous Sand Mills (90 ton per hour total output) with Storage Hoppers forming part of new Sand Conditioning and Distribution System installed in new Building to step up prepared sand requirements in the large Iron Foundry of The Staveley Iron and Chemical Co. Ltd.

Some illustrations showing the two separate Foundry installations which we have been privileged to supply to our Clients, The Staveley Iron and Chemical Co. Ltd., Chesterfield.

(All photographs reproduced by courtesy of The Staveley Iron & Chemical Co. Ltd.)

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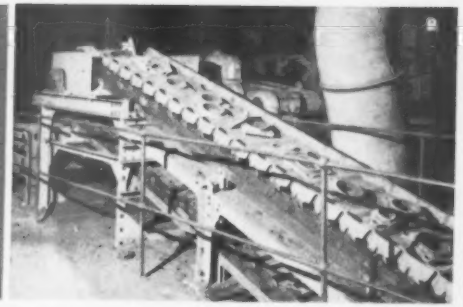
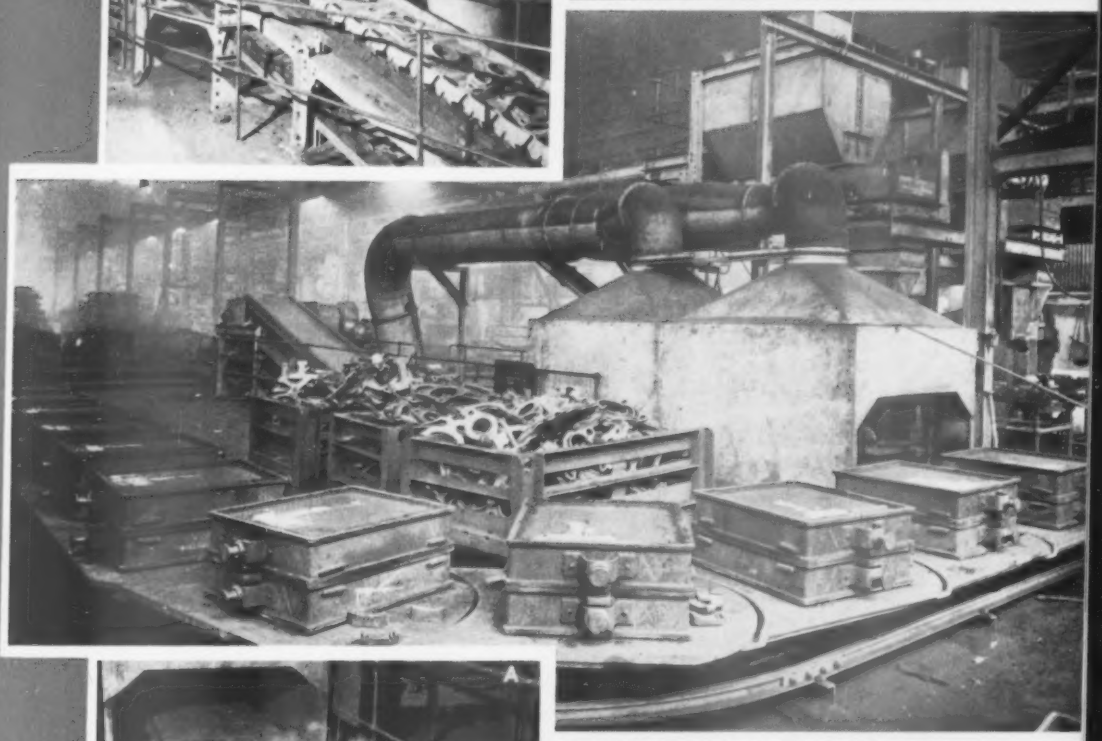
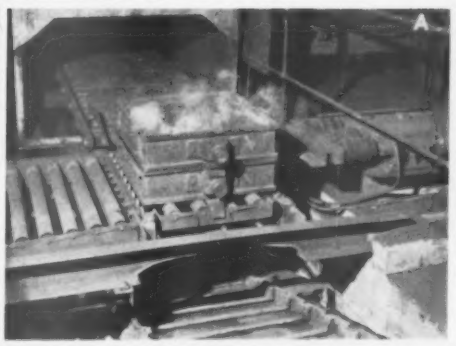
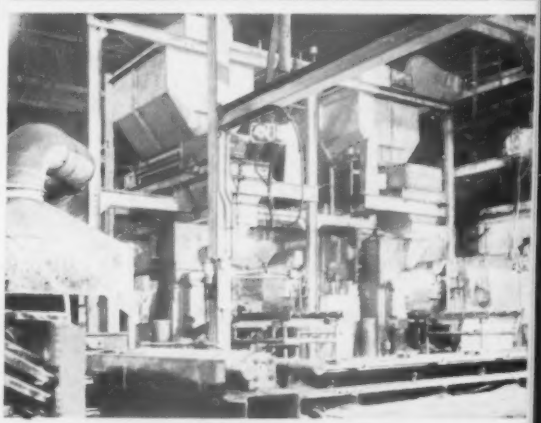


View of Mould Conveyor and Inclined Shakeout and Casting Conveyor. Inset A. shows discharge end of automatic shakeout, empty box return unit and castings disposal. Sand falls through shakeout and returns to system. Inset B. shows heavy duty hot castings conveyor from automatic shakeout.







General View of Semi-Automatic Special Moulding Unit showing sand feed system, mould conveyor and handling plant.

OVERSEAS COMPANIES:

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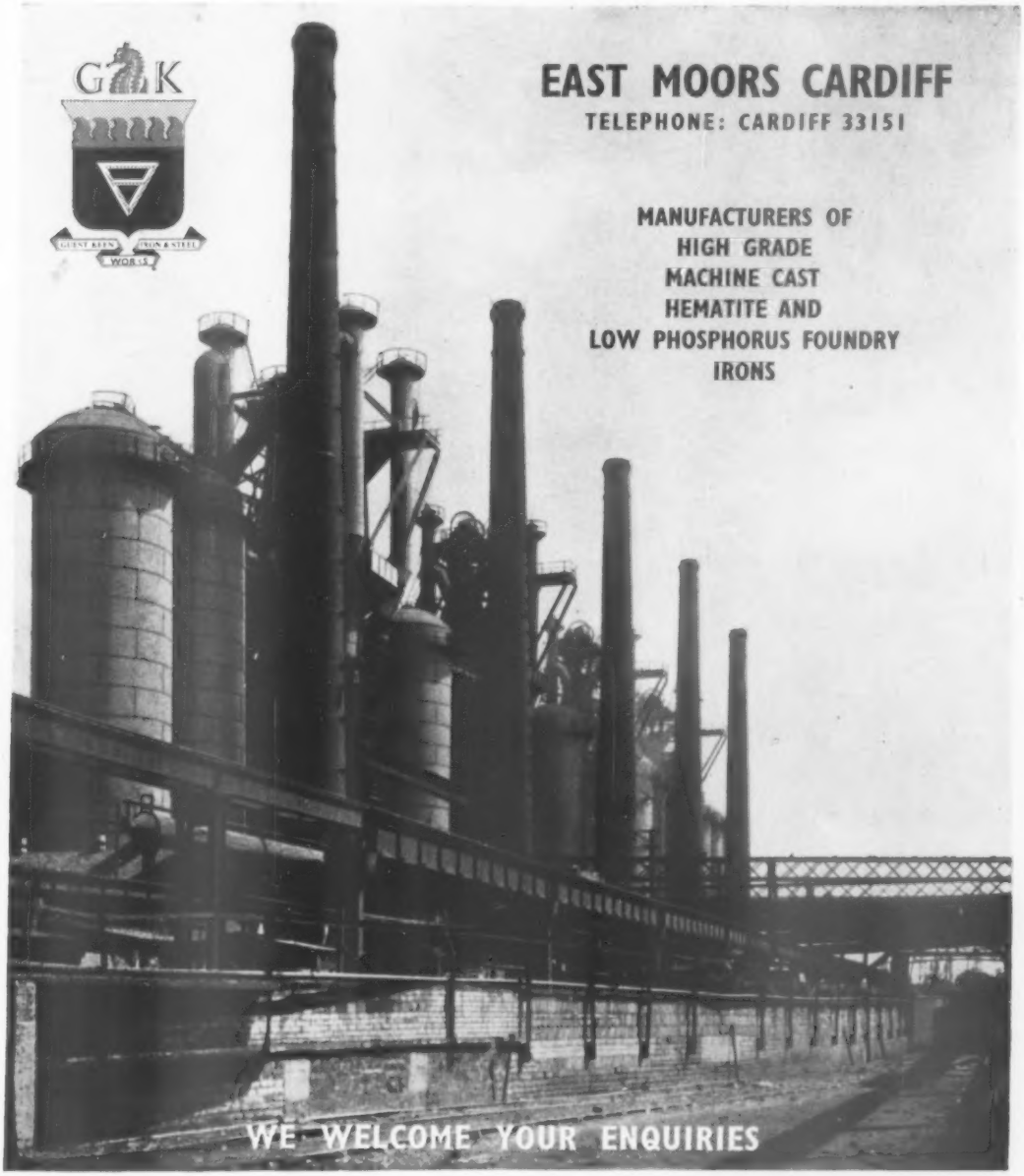

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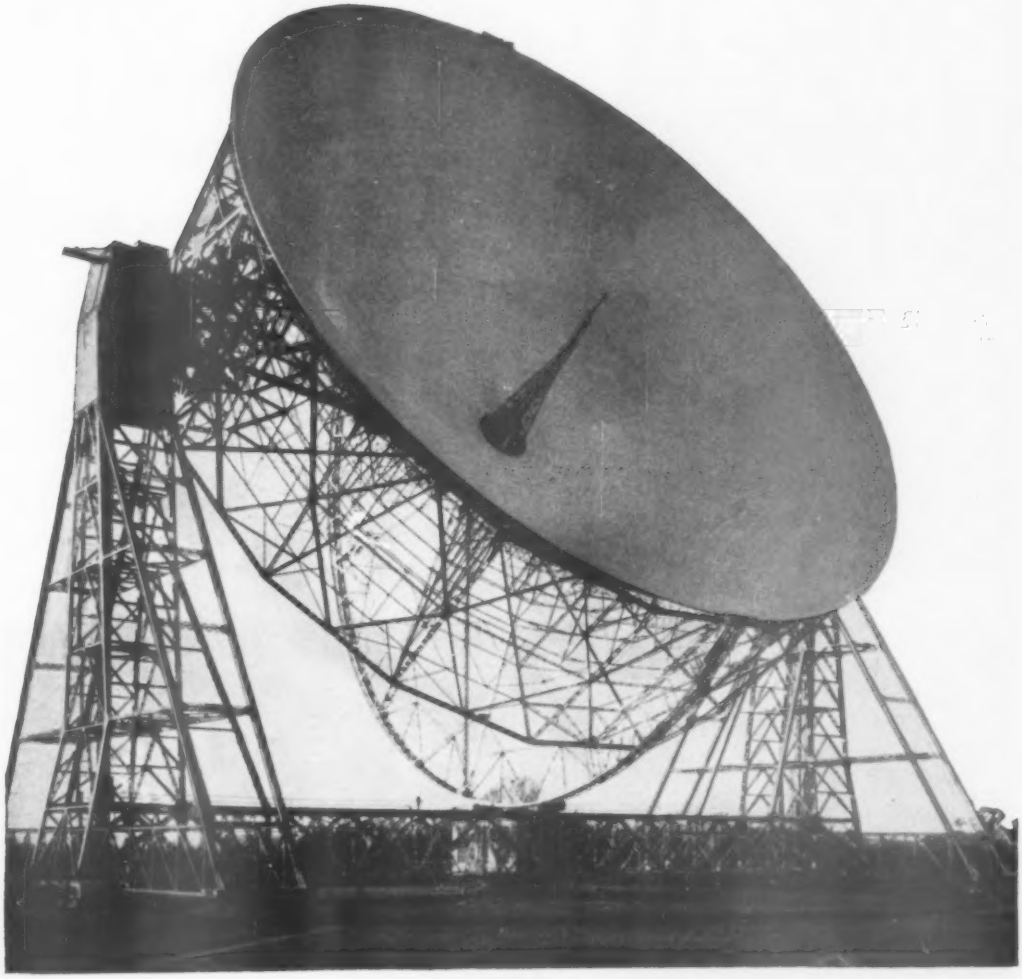

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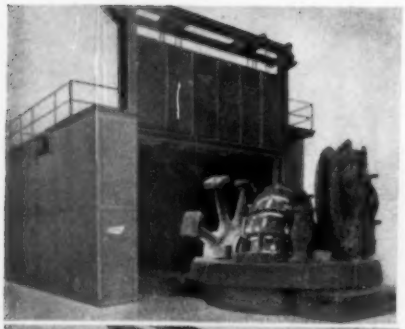

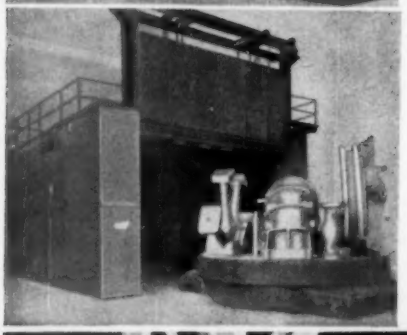

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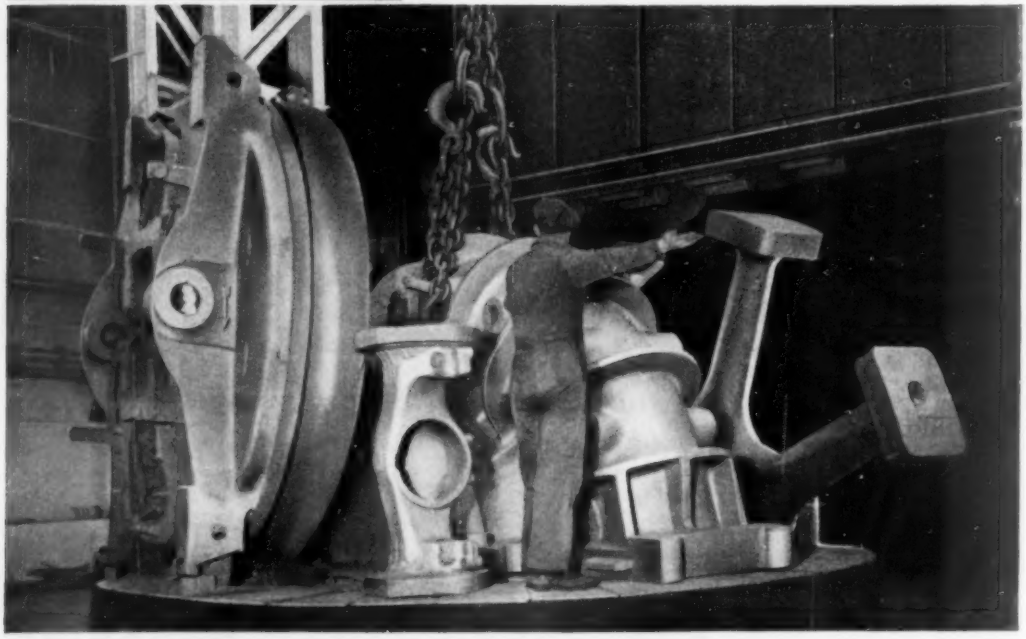

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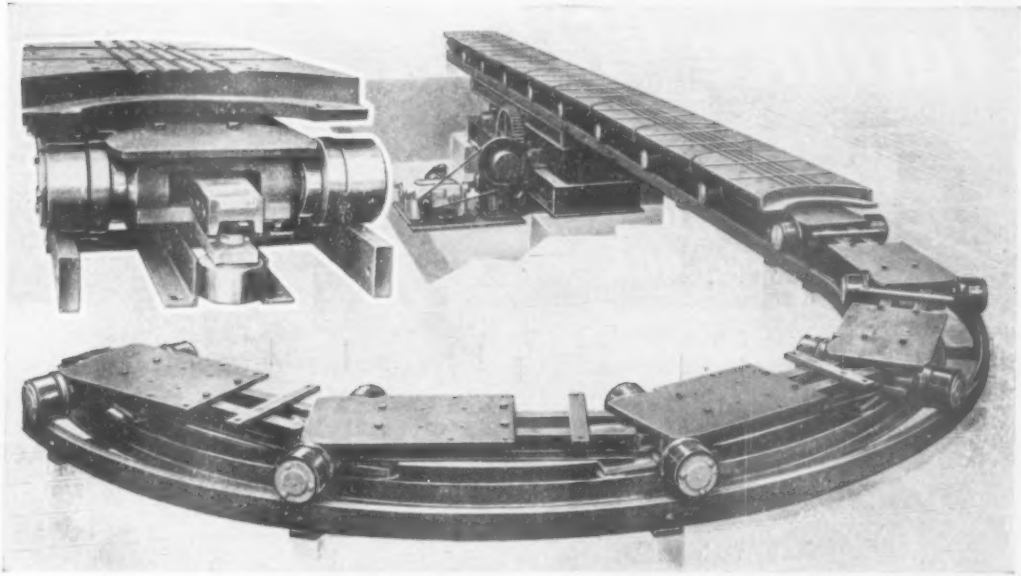
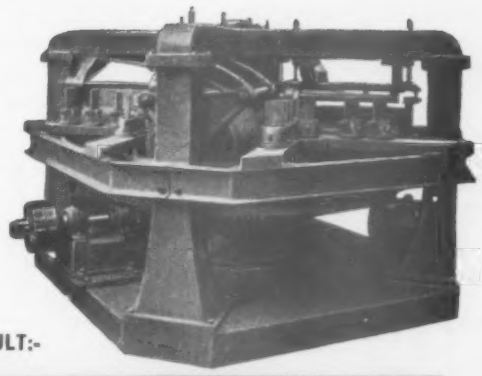
PLANTS



TYPICAL MOULD CONVEYOR SHOWING SOME C.I. PLATES REMOVED, ALSO DETAILS OF AXLES. SIZES TO REQUIREMENTS



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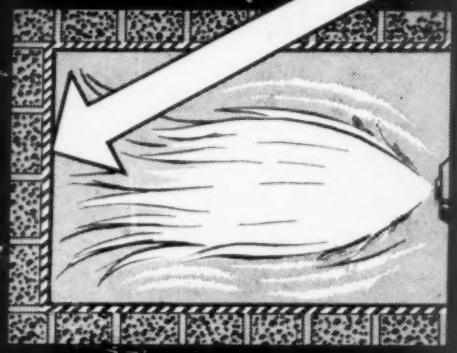

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Fourteenth century carving in Winchester Cathedral of sow playing the double pipe while suckling her litter Photograph by Ruth Meyler & F. C. Sillar

50 MILLION PIGS GO TO MARKET!

In the early days of the industrial revolution manufacturers frequently looked for familiar and easily recognisable descriptions of their products. To the countryman transplanted into industrial surroundings nothing was more familiar than a pig; a fact which is emphasised by carvings in scores of old churches depicting pigs suckling their litter, rooting for acorns and playing the bagpipes. (Apparently this last pastime was forsworn by pigs many years ago because of unpleasant associations between bagpipes and pigs bladders.) Consequently, when iron from Blast Furnaces was directed into long troughs and from there into short and narrow troughs placed at right angles, a resemblance to sows suckling their appendaged litter led to the description of 'pig iron'.

This series of advertisements illustrates some of the 'ecclesiastical' pigs and emphasises the 50,000,000 'special' pigs which Warner and Company have supplied to Iron Foundries producing High Duty Castings.

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"Pioneers of Refined Pigiron"

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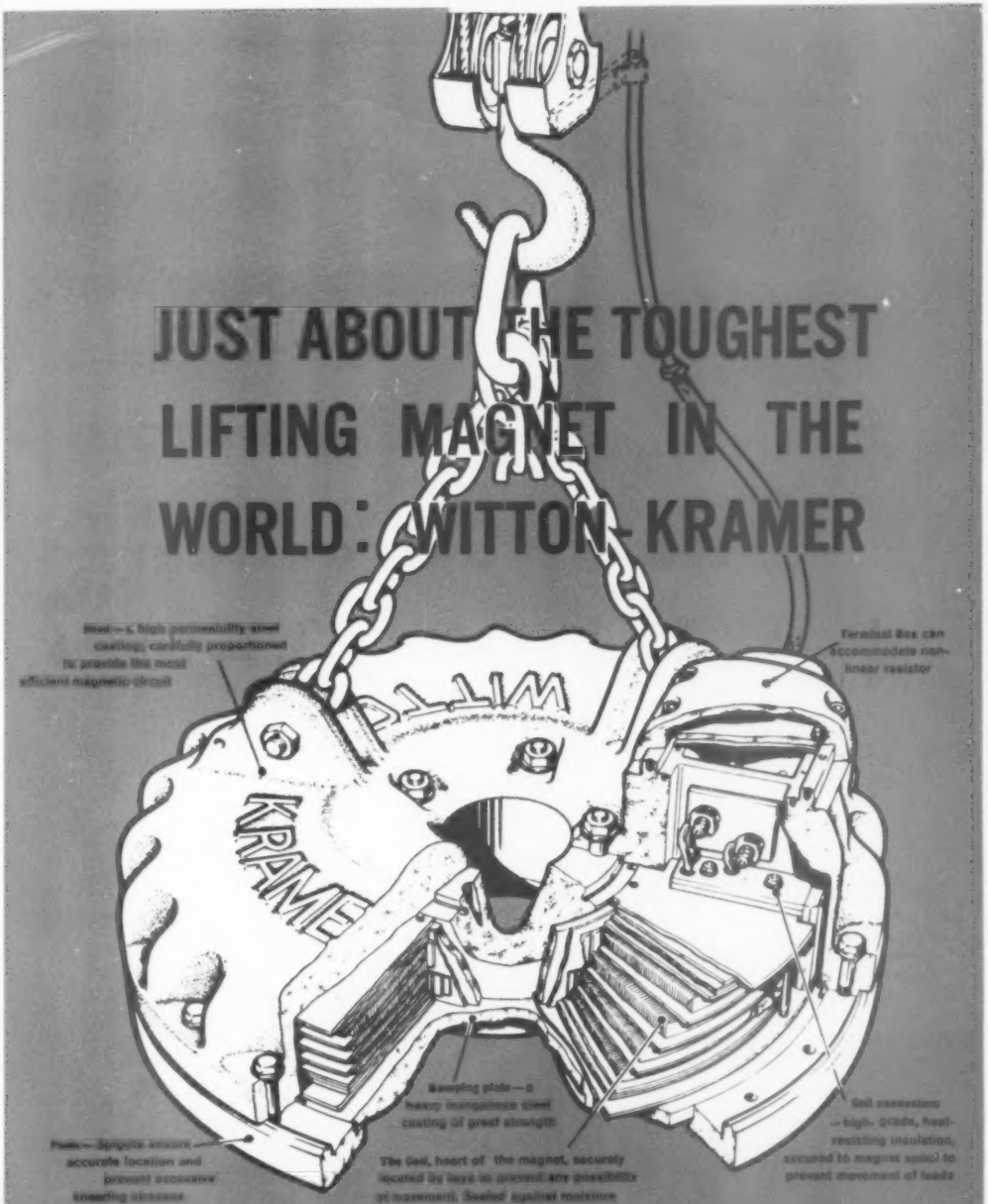
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RELY ON THE EXPERIENCE OF G.E.C.

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1961 to 1970

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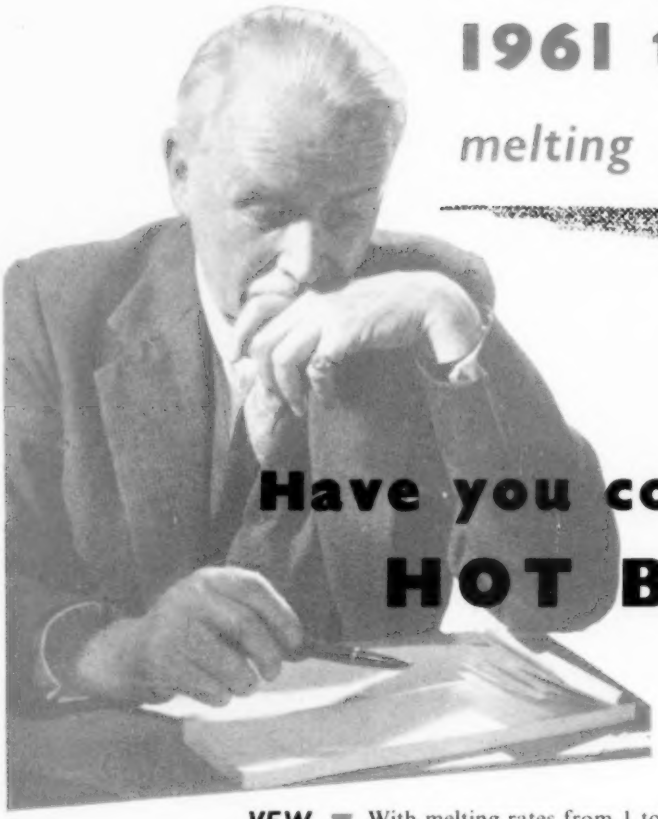

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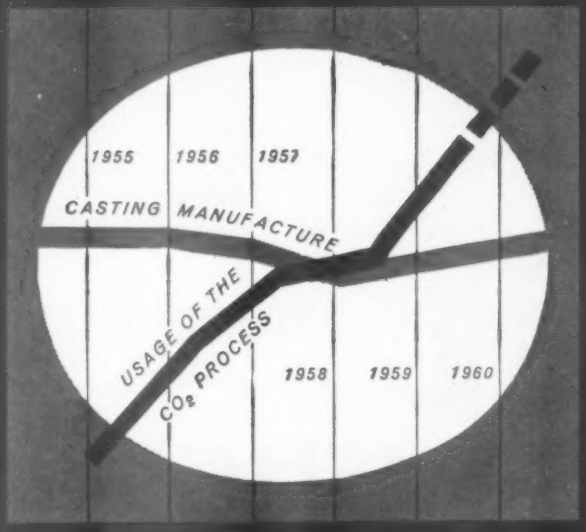

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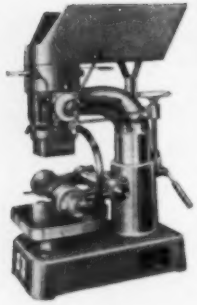

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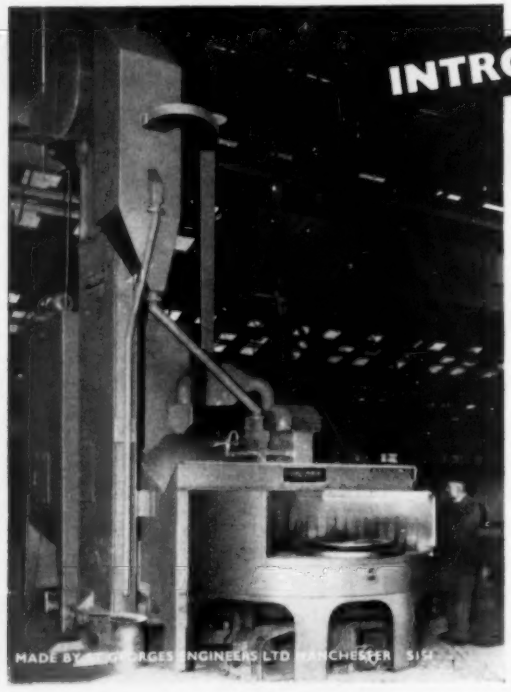

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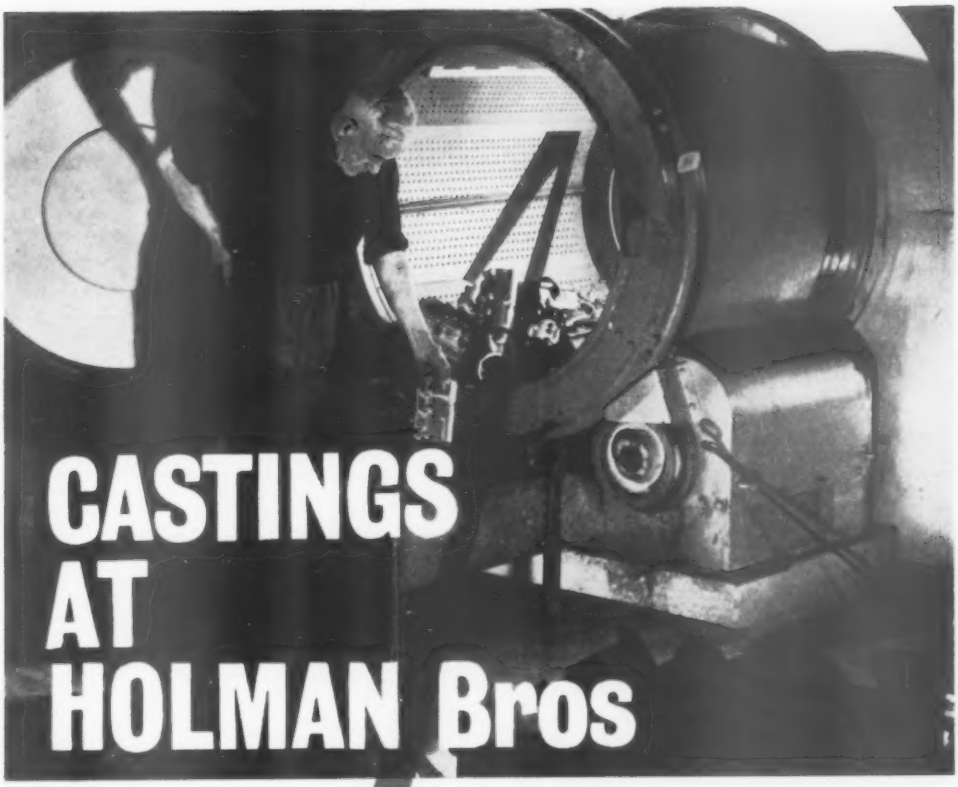

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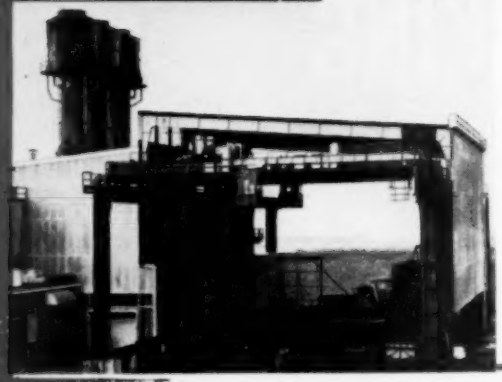

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Left : View from stockyard showing wet dust arresters.

Right : Tapping one of the cupolas into a 30 ton ladle.

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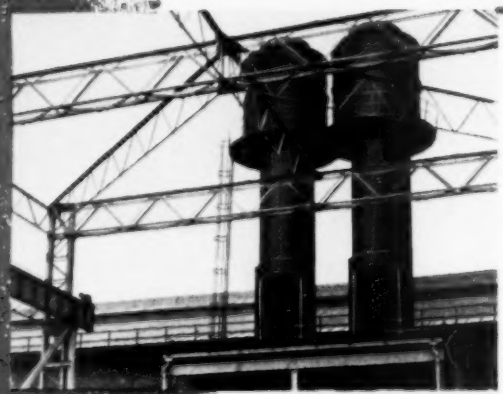

Left : Water from these wet dust arresters after being used for slag granulation, passes to a settling tank which has an automatic sludge ejector. The acidity is automatically controlled before the water is recirculated to the arresters.

Right : Two 17 20 ton-per-hour cupolas (shell diameter 8 feet) with 15 ton oil-fired stationary hot metal receiver.

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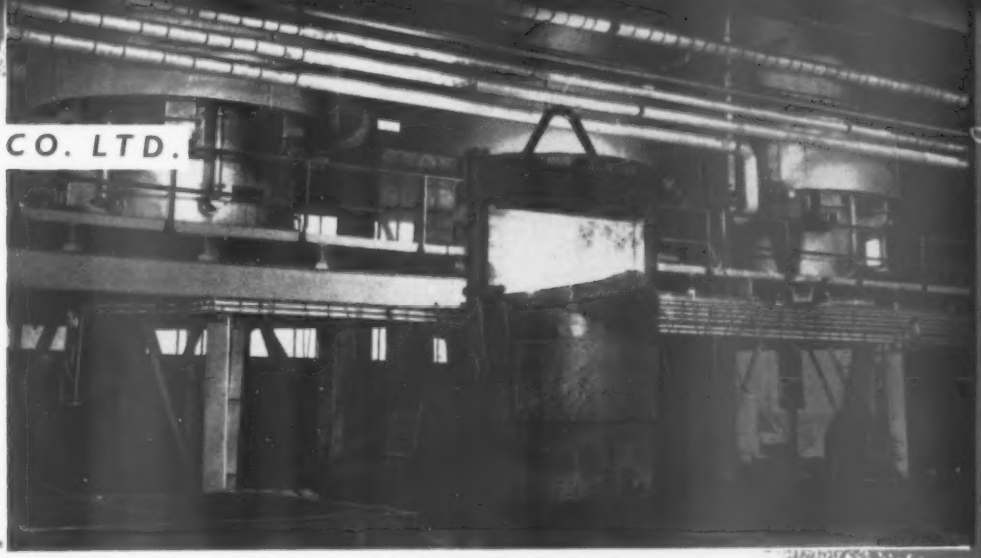

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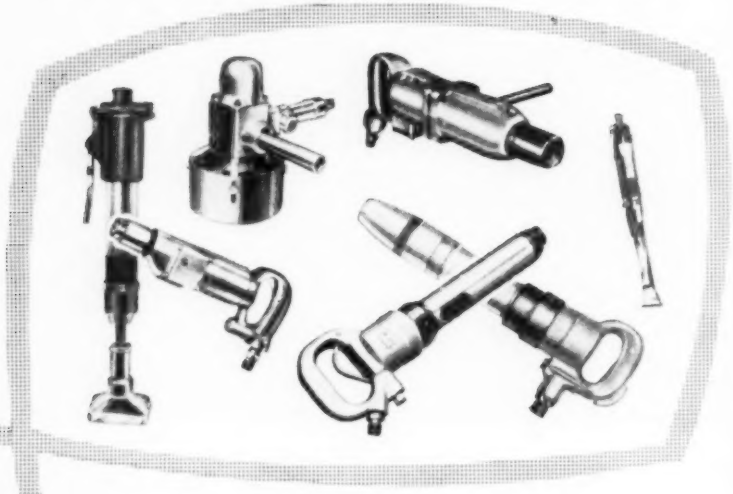

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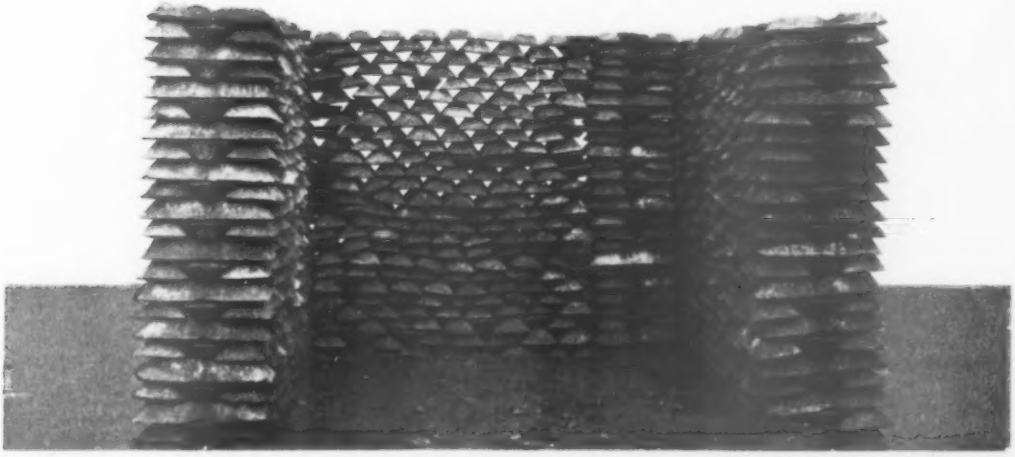

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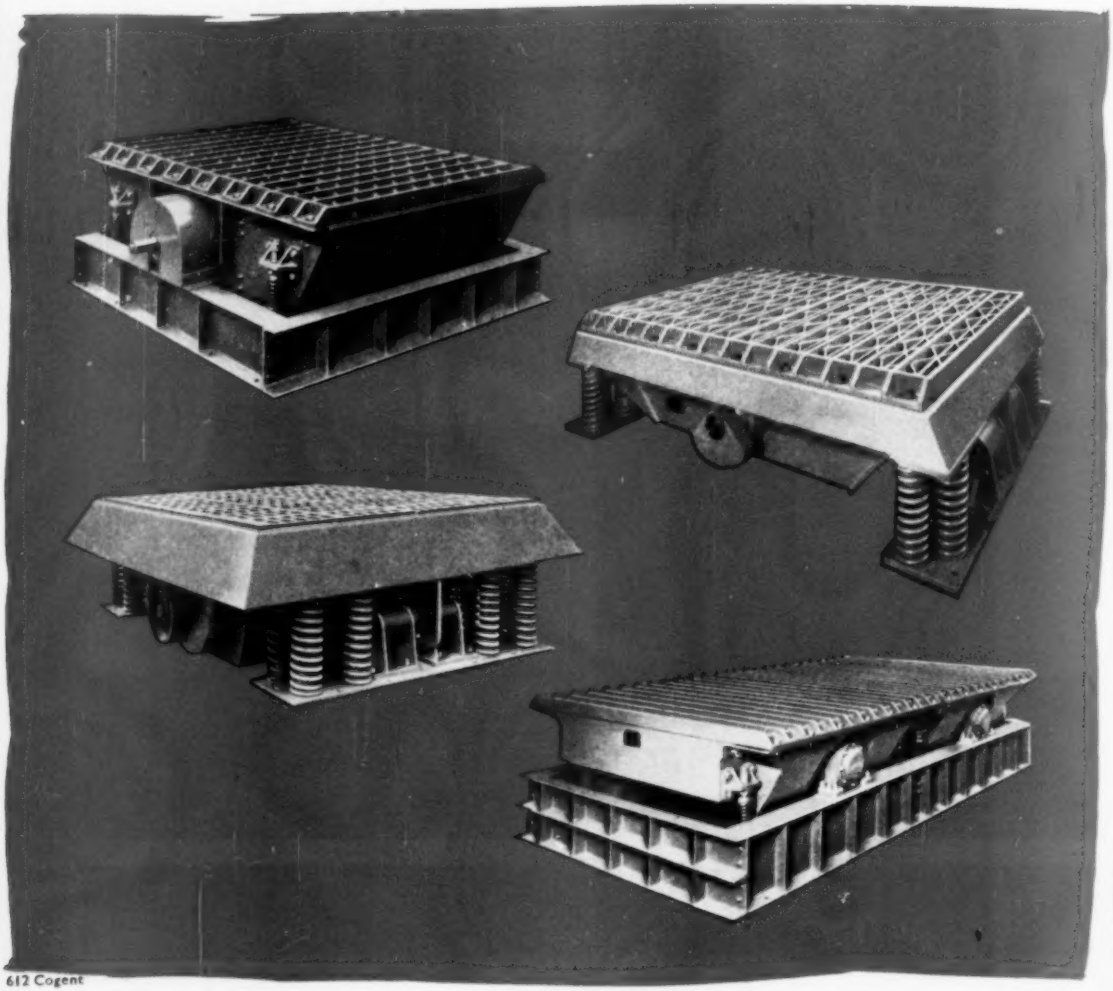

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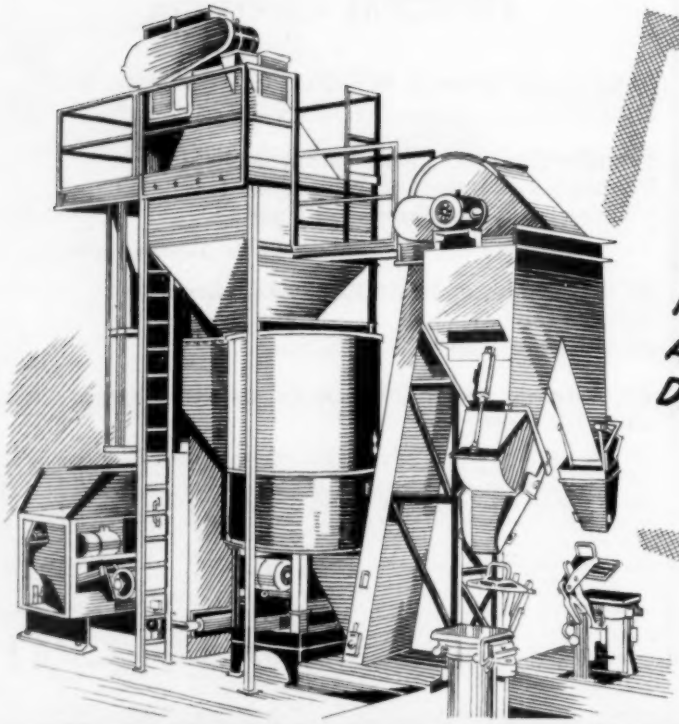

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FOUNDRY
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Skill Where it's Needed

Re-reading the correspondence originating in a letter from Dr. David Epstein, and followed by others from Mr. W. H. Bond and Mr. C. Reynolds, it appears to us to be obvious that the main point has been missed. It is correct that the old-time moulder and coremaker had to have skills additional to those required to-day. He had to prepare and mix his own sands, select his preferred moulding boxes, make much of the tackle used himself, and often he had to adjust unsuitable patterns. These jobs nowadays—with the exception of practice in the very smallest jobbing foundries—are done for him. Yet despite all this, jobbing moulding and some types of coremaking are still highly-skilled jobs. Since the development of the foundry industry to its present level of technique, many new auxiliary skills have been added, such as time-study, planning and progress departments.

A point not specially stressed is the decrease, through mechanization, of the skill required globally. To-day the foundry industry of the world turns out every year an increasing weight of castings with reduced manpower for this tonnage. Yet of this residue of manpower there is an ever-increasing number of occupations involved in helping the basic craftsmen of the industry. Hence the recruitment is also changing, the present stress—due to the increasing mechanization—being upon technologists and technicians. Obviously, jobbing founders must ensure a continuous supply of moulders and coremakers. In general, the former will be craftsmen able to work loose patterns, as loam moulding is not expanding. In Belgium, it used to be customary simply to give a blueprint of a casting to a moulder and he carried through, with a minimum of tackle, his most important of jobs. In this country, he usually had the assistance of a skilled patternmaker at least for checking major dimensions.

No mention has been made in the correspondence of the changes that have been made in the work of that most-highly-skilled of all men—the foreman. No longer does he " hire and fire " labour. His elementary costing system has been placed in the hands of cost accountants. He is helped, in the larger establishments, by a safety officer. Metal preparation has been transferred to the metallurgist, and so forth. Yet his skill, though perhaps no longer of the type previously deemed essential, is still a paramount factor in the proper conduct of the foundry. The expression " skill," which can be wide in interpretation, is found *par excellence* in a good foundry foreman.

Correspondence

To the Editor of the FOUNDRY TRADE JOURNAL

BRASS AND BRONZE FOUNDING

SIR,—In the JOURNAL for February 18, reference is made to the assistance given to the American foundry industry by the (American) Brass and Bronze Ingot Institute by means of sponsored research work on yellow-metal alloys, as well as publicity to increase the usage of these alloys. The American ingot producers are alive to the necessity of improving their alloys and publicizing the advantages of using yellow-metal ingots.

I am afraid that our foundry industry as a whole (and with it I include the ingot manufacturers as well as the copper producers) does not seem to have the same appreciation that designers and engineers must be supplied with alloys having better physical properties than in the past and that these properties as well as the suitability of an alloy for any particular job, must be made known to them.

Improved alloys by themselves are not all that are needed; improved production methods such as centrifugal and continuous casting, shell moulding, and the CO_2 Process also have a tremendous effect upon improving the properties of alloys. These are just a few improved methods which come to mind and which have proved themselves. Who knows what other methods can be evolved if the wherewithall to develop them is available? Finally, the designer and engineer have to be made aware of these properties and the advantages of using yellow metals before they will use them in preference to other materials such as fabrications, substitute metals, plastics, etc. It is most desirable that, in the first place, designers should have at their finger-tips the fullest possible knowledge of the best materials for any particular job. Where these best materials are yellow metals in cast form, it is essential that they be presented by a united industry which is willing to spend money and carry out work on research and development in order to keep its products in the forefront.

The Association of Bronze & Brass Founders is the official body representing the yellow-metal foundry industry of this country but whilst it includes a majority of the important bronze and brass founders and accounts for a high percentage of the output of the UK, it cannot be expected to carry the whole burden of research and development for the industry. Particularly is this true since the researches which they instigate are carried out by the British Non-Ferrous Metals Research Association and, therefore, must be made available to industry as a whole. In fact, the technical advisory and research group of the ABBF consists of fewer than 50 per cent. of Association members, contributing approximately £2,500 yearly for research—a meagre sum for such an important branch of the foundry industry. The Council of the ABBF have given much thought and devoted a great deal of work to finding ways and means of increasing the funds available for research and development and having taken some part in this work myself, it is my opinion that the following action is required:—

(1) All bronze and brass founders should join the ABBF.

(2) All members of the ABBF should become members of the research group.

(3) Copper producers should allocate funds for bronze and brass foundry research and development.

(4) Bronze and brass ingot manufacturers should do likewise.

Such action would bring in a more reasonable sum which might then be increased by funds from the Department of Scientific and Industrial Research, and which could come under the direction of a central body comprising producers and founders.

I am convinced that this matter must be treated seriously and by the industry as a whole.

The copper producers and ingot manufacturers must surely be aware that the foundry industry is an important part of their business and founders themselves must realise that there is a very real threat to the future of their business from other materials unless they are prepared to do something about it.

Are they all just going to let the industry die because they will not afford to spend what is surely only a small amount of money! If they do they cannot blame anyone but themselves when they find their business falling away! Yours, etc.

W. R. BUXTON.*

Merton Abbey, London, S.W.19.

* Mr. Buxton is vice-president of the Association of Brass & Bronze Founders.

"Open House" at Foundry Equipment

Foundry Equipment, Limited, announce that they are holding another "Open House" at their Linslade Works in Leighton Buzzard, Bedfordshire, and this year the event will take place from Monday, May 8, to Friday, May 12, the foundry and all the shops being open from 9 a.m. to 6 p.m. daily. The arrangements, which will be similar to those of last year, will include demonstrations of new machines, *e.g.*, shell coreblowers, a conveyor-belt sand mill, centrifugal casting machines, shotblast equipment, etc., and various improvements to existing machines will also be on view.

The company extends a welcome to all interested foundrymen, and suggests that firms wishing to send representatives should notify the number they expect to attend, the names of their people, also the date and time at which they would like to come along. Catering arrangements are being made by the company to provide luncheon, tea, and other refreshments for their visitors.

Metallurgical Co-operation

To enable closer co-operation between the Iron and Steel Institute, the Institute of Metals, and the Institution of Metallurgists, a joint consultative committee has been set up by the three Councils to advise on all activities and questions of common interest. This follows a recent decision of the Councils that amalgamation of the three societies would not be practicable within the foreseeable future.

The three Councils are convinced that every qualified metallurgist should be a member of the professional institution and of his appropriate scientific and technical institute, and should contribute to and influence the work of both. With this in view, the Council of the Institution of Metallurgists has altered the standard subscriptions payable by members, enrolled graduates and enrolled students of the Institution resident in the United Kingdom. By agreement of the three Councils, all those in the Institution of Metallurgists who pay these revised standard subscriptions will automatically have the right to apply for membership of one of the other two institutes without liability for payment of a further membership subscription to that institute.

Light-metal Industry in India

Extracts from February's Symposium at Jamshedpur

A Symposium on the "Light Metal Industry in India" was held from February 14 to 17 in the auditorium of the organizers, the National Metallurgical Laboratory, Jamshedpur. The objective of the symposium was to focus attention on the latest technological and research developments in the field of light metals and their alloys and to emphasize the general growth of the light-metal industry in India during the third Five Year Plan, with particular reference to indigenous production. The scope of the symposium was divided into 10 sections as follow: (1) Indigenous raw materials for the light-metals industry, their assessment, preparation, etc.; (2) pyro-, electro- and hydro-metallurgical techniques of production of light metals and their alloys in the general context of indigenous raw materials and resources; (3) physico-chemical reactions governing the extraction metallurgy of light metals and alloys based on theoretical, thermo-dynamic and thermo-efficiency considerations; (4) recent technological advances in metal casting, including continuous-casting techniques, special metal-working processes including cladding, extrusion, deep-drawing, pressing, etc.; (5) reclamation and refining of light-alloy scrap and development of the Indian secondary-alloy industry; (6) recent developments in heat-treatment of light metals and alloys including specialized equipment, etc.; (7) physical, chemical, corrosion-resistance properties of light metals and their alloys at room and elevated temperatures; (8) physical metallurgy of light metals and their alloys; (9) rôle of light metals in metallurgical, chemical engineering and nuclear-reactor technology, and (10) present status and future expansion of the light-metal industry in India in relation to the Five Year Plans and world-production trends.

Details of Proceedings

The Symposium drew a large gathering (Fig. 1) of high-ranking scientists and technologists from all over the world including, *inter alia*, Mr. W. E. Bardgett (president, Institution of Metallurgists, and research manager, Swindon laboratories, of United Steel Companies, Limited); Mr. T. Benson-Gyles (W. S. Atkins & Partners, London); Mr. J. Blakiston, M.I.MECH.E. (engineering and foundry consultant, Halifax), and Mr. T. G. Digges (chief of thermal metallurgy section, National Bureau of Standards, Washington, USA). The proceedings of the Symposium were inaugurated by Professor M. S. Thacker, director-general, Scientific & Industrial research (India), and Sir Jehangir Ghandy, chairman of the Executive Council, National Metallurgical Laboratory, presided.

Dr. B. R. Nijhawan, director, National Metallurgical Laboratory, Jamshedpur, welcomed the delegates and referred to the Symposium as a "metallurgical summit" in having attracted valuable technical contributions from specialists in their fields and in gathering together distinguished scientists, metallurgists, and technologists from many parts of the world. In his presidential address, Sir Jehangir said that research on metals continued to ensure progress for the development of light metals

FIG. 1.—*Delegates attending the Indian symposium on the light-metals industry, shown outside the National Metallurgical Laboratory where the function was held.*

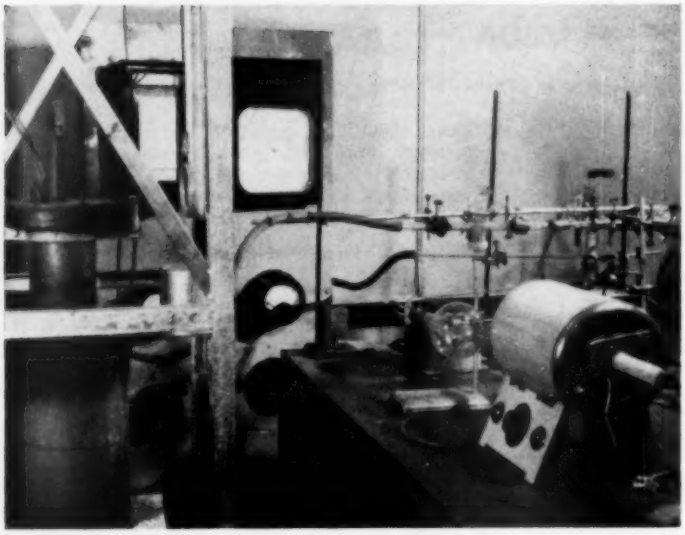


FIG. 2.—*Experimental set-up at the National Metallurgical Laboratory, Jamshedpur, for the production of magnesium metal.*

and their alloys with superior structural stability at sub-zero and elevated-temperature uses. He commended the work done by the National Metallurgical Laboratory in the metallurgy of light metals. Professor Thacker, in his inaugural address, stressed the need for comprehensive planning to raise Indian economy and standards and pleaded that serious thought should be given to integrate the survey of all resources available in India, and concluded by paying a tribute to Dr. Nijhawan and his staff for the work they were doing towards the development of metal and mineral industries in India.

A total of 27 technical papers were presented during the Symposium, of which three emanated from the US, three from the UK, one from Japan, one from Switzerland, and one from Germany, the remainder being presented by leading metallurgists and scientists of India. In addition to the technical contributions a visit was paid during the Symposium to the low-shaft furnace pilot-plant of the National Metallurgical Laboratory; an evening lecture on " Future of Electric Furnaces in the Metal Industries of India " was given by Professor G. R. Bashforth, UNESCO expert in metallurgy and Professor of Ferrous Production Metallurgy at Benares Hindu University. A variety entertainment of the dances of India was arranged, in addition to film shows.

Technical Sessions

The subjects covered by the technical contributions presented during the Symposium were wide and varied and what follow are abstracts of some of the 27 papers presented—In a paper entitled " Prospects of Aluminium in India," Dr. P. Dayal (Ministry of Commerce and Industry, Government of India) claimed that aluminium—youngest of the major non-ferrous metals—has within 70 years, achieved an industrial importance comparable to that of copper and second only to steel. His contribution dealt mainly with the present demand for aluminium in India, the rate of consumption during the last 10 years and expected trends in demand during the next 10 to 15 years. The present demand of aluminium which was estimated to be 45,000 to 50,000 tons per year was expected to reach 150,000 tons per year by 1965/66. He reviewed the position of the availability of raw materials for the aluminium industry in India and discussed the price structure and export possibilities for the alloy.

" Foundry " Contributions

Another subject covered was " Strength of Moist Foundry Sands in relation to the Surface Finish of Aluminium Sand Castings," dealt with fully by Dr. Ing. S. S. Khanna and Dr. D. Swarup (of the College of Mining and Metallurgy, Benares Hindu University). In this contribution, the authors said that a new evaluation of wet tensile-strength had been developed recently in the Foundry Technical High School at Aachen, West Germany, which showed very good correlation with the scabbing tendency of moulding materials and had been found to be of practical importance in order to control the quality of aluminium castings. The influence of various factors such as (a) water content, (b) clay content, (c) preparation method, (d) shape and size of the sand grains, and (e) activation with sodium carbonate and other salts were discussed. In the investigation described, test-pieces in Al/Si alloy were cast in the form of plates and a correlated study was made to establish the relationship between wet tensile-strength and scabbing tendency under the following experimental conditions: (1) increasing amount of natural Na-base (Wyoming) bentonite; (2) increasing degree of activation of Ca-bentonite (from Mainburg) with sodium carbonate; (3) change in maximum wet tensile-strength values when using different qualities of bonding clays, and (4) using different activating salts under optimum conditions. It had been found that if wet tensile-strength was very low due to the expansion of the silica sand, on heating, the dried surface layer was separated along the condensation zone and, as a consequence, scabs, rat-tails and buckles occurred.

General Metallurgy

In a paper entitled "Scope for Development of the Magnesium Industry in India," the authors, Mr. R. N. Misra, Mr. V. S. Sampath and Mr. P. P. Bhatnagar (of the National Metallurgical Laboratory) reviewed the resources of magnesium minerals in India, on the basis of which the need to establish the local magnesium industry had been stressed, with a view to meeting increasing civil and defence requirements. Advantages and disadvantages of the use of different production methods were outlined in relation to direct-reduction processes. The paper also briefly described the layout of the proposed magnesium pilot-plant under installation at the National Metallurgical Laboratory (Fig. 2) which was designed to produce 25 lb. of metal per day, and magnesium powder.

Mr. J. Wood (of International Alloys, Limited, Aylesbury, Bucks) dealt with "Effect of Composition and Thermal Treatment on the Natural Ageing of Al/Zn/Cu Alloys." He described tests which had been made on Al/Zn/Cu alloys (11 per cent. Zn, three per cent. Cu) to determine the effect of composition and thermal treatment on the mechanical properties of 1-in. dia. sand-cast test-bars. These showed that the alloy age-hardens at room temperature to give high tensile-strength and hardness. For example, the tensile-strength rose from 10 tons per sq. in. to 15 tons per sq. in. and the Brinell hardness from 80 to 110 after 2 to 3 weeks' ageing. The rate of age-hardening had been found to be mainly dependent on the magnesium content, maximum strength being obtainable with about 0.1 per cent. magnesium. Stabilizing treatment at 250 deg. C. reduced ageing, but did not completely inhibit it.

Mr. Kazuo Hori (assistant professor of metallurgy, Kumamoto University, Japan) presented a paper entitled "Movements of Absorbed Gases in Aluminium." In this contribution he reported on a study of changes caused by absorbed gases in the flow-properties of molten metals, particularly aluminium, and also elucidated the relationship between gases and metal atoms in the molten state, the liquid structure of metals and the principles of melting of metals. Experiments carried out on the influence of temperature of pouring on the flowability of aluminium showed that this property could be enhanced only up to an optimum temperature limit beyond which increase in temperature adversely affected flow. Flowability of metal degassed in the molten state showed an abrupt change at a certain temperature and this effect had been attributed to the presence of absorbed gases in the molten metal. It had in fact been shown that from a study of viscosity of molten aluminium, both in neutral atmosphere and in air, that the flowability or castability of molten metals was greatly influenced by absorbed gases and that the viscosity of molten metal containing absorbed gas at low temperature was lower than that of molten metal where gases were absent. This, he said, could be correlated with the established fact that "rimmed" steel had a better flowability than "killed" steel. It had also been observed that small amounts of absorbed gases were useful in decreasing the viscosity of molten metals. The author explained his results on the basis of experiments carried out and advocated a "disturbance theory" for the lowering of viscosity of molten metal caused by absorbed gases. By means of an improved apparatus of Sieverts type, the author showed that the main gas absorbed in molten aluminium was hydrogen which he measured quantitatively at a minimum value of viscosity. Experiments were also carried out on the flow properties of molten aluminium under different changes of atmosphere between melting and casting; it was found that these properties were mainly determined by the melting atmosphere on account of gas absorption at that stage.

Concluding Address

In his concluding address, Dr. Nijhawan summarized, in general, the technical papers presented and stressed the salient points brought out in the discussions which followed. He thanked all the participating delegates from India and overseas, the authors of the papers and all those who had taken part in the discussions. He also paid tribute to the organizers of the Symposium, Dr. T. Banerjee (deputy director) and Dr. R. M. Krishnan (assistant director) and other members of the staff of the National Metallurgical Laboratory who had done so much to make the Symposium such a success.

Ball-race Bogie

By C. J. Robb

One of the most unusual transport bogies was invented by Lord Annesley in 1794. Its purpose was to remove large blocks of granite from the quarry in the Mountains of Mourne to the harbour at Newcastle Co. Down. This vehicle was 6-ft. long by 4-ft. wide and consisted of a series of rollers, each being made up of eight cast-iron balls 9-in. in dia. mounted on an axle which ran through the balls, and they were kept on it by large washers and lynch pins. There were four such axles with roller balls fitted under the flat carriage work of the bogie on cast-iron angle-brackets akin to the farm roller. The ball bearing truck was ideal for moving down the rough mountain track to the harbour, and Lord Annesley's invention was applauded by engineers of the time. The cast-iron balls stood up well to hard wear, and bore blocks of granite of six tons and more. This was one of the peculiar uses of cast iron. One of these bogies being used at a quarry at Killiney, Co. Dublin, gave the designer of the George IV obelisk the idea of setting the pillar on four balls. The balls were cast for this purpose, but the Board of Works in Dublin objected to their use as it was suggested that they would corrode. They were, therefore, replaced by granite balls with cast-iron studs in their centres to bear the dead load of the column. This monument still stands, at the place originally called Kingstown. Thus, roller cast-iron balls had their place in reducing friction in traction before the days of the ball-race.

PLANS HAVE BEEN APPROVED for a new warehouse for George Salter & Company, Limited, West Bromwich, at a cost of £100,000.

Metallurgical Influences on Mechanical Properties of Induction-furnace-melted 13-per-cent. Chromium-steel Castings*

By Dr. Jaroslav Koutsky

In the last issue of the JOURNAL was published part of a Czech report on careful experiments carried out on 13-per-cent. chromium steel. This issue completes the consideration of the practical work and concludes the article with the Author's detailed analysis of results and his formulation of the main conclusions from them.

Continued from JOURNAL, *March 30, page 404.*

The first section of this report on 13-per-cent. chromium steel dealt with the following experimental aspects of the work that has been carried out in connection with this investigation: heat-treatment, chemical composition, and—in part—properties of induction-furnace melts. Each of the factors involved in these aspects was related to its effects on the physical properties of the steel—particularly the notch-impact values. The part that was uncompleted in the last issue covered the topics: the melting furnace—basic or acid lining; the metallurgical process—the effect of the charge, of the type of ferro/chromium, and the method of adding ferro/chromium. It continues with:—

Method of Deoxidation

Experiments were carried out with alternative methods of deoxidation with Al, CaSi, ZrSi and complex deoxidation. The castings from melt D1 to D4 were deoxidized in the ladle: 1st casting not deoxidized, 2nd casting Al 0.05, 3rd casting Al 0.15, 4th casting CaSi 0.30 per cent. The casting temperature in all instances varied between 1,480 and 1,500 deg. C. The worst notch-impact values resulted from deoxidation with Al 0.15 per cent., and the best values were shown by castings which were not deoxidized or deoxidized with CaSi. It is remarkable that in the quenched and tempered state a precipitate is manifested within the ferritic grains in all the castings with the exception of the casting deoxidized with Al 0.15 per cent.

The further melt D9 to D12 was deoxidized as follows: 1st casting Al, 0.05, 2nd casting CaSi 0.15, 3rd casting ZrSi 0.30, 4th casting Al 0.05 + ZrSi 0.30 per cent. Deoxidation with ZrSi acts less effectively by comparison with CaSi, and complex deoxidation with ZrSi + Al shows no advantage whatever. In the cast state it was established in the specimen which was treated by complex deoxidation (D12), that a carbide phase was present on the martensitic grain boundaries in the form of skeleton crystals. In the quenched and tempered state in all instances there was disintegrated δ-ferrite. For melt D13 to D16 the previous deoxidation method was repeated, but before tapping, the melt was moderately raised in temperature to over 1,650 deg. C. The effect of the individual methods of deoxidation scarcely differed from the previous effect. In the quenched and tempered state a precipitate was liberated in the ferrite of all the specimens. From the photograph of the fractures (Fig. 26) it is evident that CaSi and complex deoxidation suppress the columnar layer.

Melting and Casting Temperature

20-kg. of melt T1 to T44 were melted normally and cast at 1,480 to 1,500 deg. C. after deoxidation with Al 0.05 per cent. The remainder was heated in the furnace to about 1,600 deg. C. and cast under the same conditions. By this means the impact strength was only moderately increased. The microstructure in the cast state was martensitic with fine carbide particles precipitated at the grain boundaries (Fig. 27). In the quenched and tempered state heterogeneous martensite formed the microstructure (Fig. 28). In the more-darkly shaded areas there was denser piling up of the carbide particles. In all instances the fractures were fine and wrinkled.

From melt T9 to T12 20-kg. were deoxidised with Al 0.05 per cent. and cast half at the high, and half at the low temperature. The remainder was heated to 1,650 to 1,700 deg. C. and cast in the same way as the first 20 kg. By this means a noticeable increase in the impact strength was achieved. In the microstructure in the cast state, apart from martensite, δ-ferrite is apparent, which in all instances contained an intergranular precipitate in the quenched and tempered state. On the fractures the heating temperature was not markedly shown. Melt T13 to T16, on reaching a temperature of 1,600 deg. C., was heated for 14 min. to attain a temperature of about 1,700 deg. C.; then FeMn and FeSi were added, and the melt was cast at 1,660, 1,590, 1,480 and 1,440 deg. C. With the possible exception of the lowest casting temperature it was impossible to record any marked differences in impact strength. The microstructure of the castings in the cast and quenched and tempered states was the same as that of melt T1 to T4. The fractures were fine and wrinkled (Fig. 29). This experiment was repeated

* Translated from *Hutnické Listy* 1960 15 (No. 3) 179 to 188. The Author is at the Lenin Works in Pilsen.

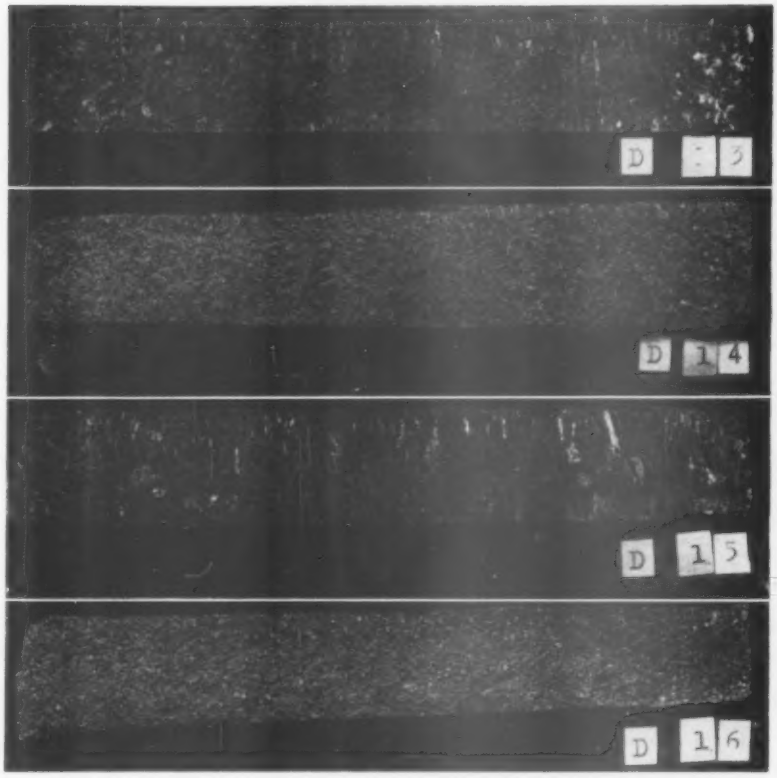


FIG. 26.—*Fractures of parts B of melt D13-D16; D13 deoxidized with Al 0.05 per cent.; D14 deoxidized with CaSi 0.15 per cent.; D15 deoxidized with ZrSi 0.30 per cent.; D16 deoxidized with Al 0.05 per cent. + ZrSi 0.30 per cent. Low casting-temperature.*

in the basic furnace with essentially the same result (melt T17 to T20).

Melt T21 to T24 was worked by the same method as melt T13 to T16, but in its structure δ-ferrite appears in both the cast and the quenched and tempered states. The results of the impact-strength tests are, however, the same, even though there are differences in appearance.

Effect of Atmosphere During Pouring

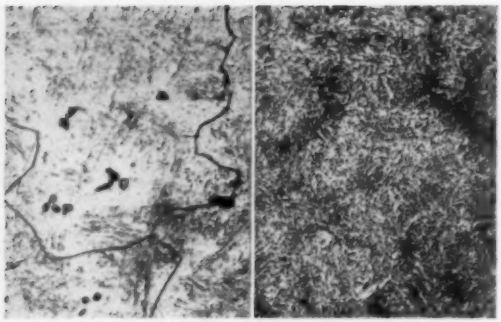
Melt L1 to L4 was worked by the same method, was deoxidized with Al 0.05 per cent., and cast at the high and low temperatures, on the one hand normally, and on the other in an atmosphere of nitrogen. The individual castings did not differ greatly from each other in relation to impact strength. In all the quenched and tempered specimens the δ-ferrite was disintegrated.

Chemical Composition

Melt S13 to S16 had a very small quantity of δ-ferrite in the structure, and melts S1 to S4 and S17 to S20 a somewhat higher content; the greatest quantity of δ-ferrite occured in melt S21 to S24, which was deoxidised with Al 0.15 per cent., and the δ-ferrite contained no intergranular precipitate. Melts S5 to S8 and S9 to S12 had a higher carbon content, and their structure was a simple ferritic phase. The impact strength of these melts is noticeably lower than that of the preceding melts.

ANALYSIS OF RESULTS

Assessment of the indisputable importance of the individual factors investigated is complicated by the action of additional factors which were difficult to observe and might have differed from melt to melt, and by the fact that apart from the factor which was intentionally changed, on many occasions the chemical composition of the melts varied also within relatively wide limits. Primarily, therefore, it is necessary to compare results obtained from different, alternative chemical compositions. According to the diagram in Fig. 12 the maximum attainable impact strength of 13-per-cent. chromium steel falls with the increasing carbon content. Melts S5 to S8 and S9 to S12, which had a higher carbon content, entirely confirm this opinion. The best impact-strength values were always attained by steels with a mixed structure, *i.e.*, in the presence of δ-ferrite, in so far as its presence was caused by a low carbon content, which was so in the majority of instances, or by a higher chromium content. The exception was presented by melt Z25 to Z28 where the carbon content was relatively high, and the chromium content on the other hand low; by comparison with the remaining melts, however, it had a substantially lower nickel content. This melt was not as a whole an exception, since even in its structure δ-ferrite was present in the cast state. By comparison with melts S17 to S20 and S21 to S24 it follows in general that it is not beneficial to choose too high a chromium content. In general it must be stressed that in melt Z17 to Z20, which contained the greatest amount of δ-ferrite, the ferrite was distributed in the structure mainly in the manner which was considered to be



FIGS. 27 AND 28.—*Microstructures of sample T1 in cast state (left hand), and quenched and tempered (right hand); etchant—picric acid.* ×100.

advantageous. In the microstructure of the cast state only exceptionally did zones occur, where the δ-ferrite formed a continuous area. For this melt we recorded the greatest variation in the notch-impact strength values (casting Z18).

Structure

The results lead, therefore, to the conclusion that the ideal structure in 13 per cent. chromium steel from the aspect of impact strength is a sorbitic structure with about 20 per cent. δ-ferrite. Since under production conditions, especially in large castings, due to considerable segregation it is difficult to achieve an even distribution of the ferritic phase, it will be better to choose a chemical composition in the close vicinity of the boundary of the homogeneous austenitic zone, for in this event losses in plastic properties will still be substantially lower. It is shown that the chemical composition, and in close relation to it, the structural factor, are the main determinants of the properties, even though the effect of these factors is modified by additional factors.

Nitride Precipitate

During the description of the microstructures of the individual melts in the preceding section it was established that in certain melts after quenching and tempering a precipitate appeared within the ferritic grains, and in others did not do so. The chemical analysis showed a substantial difference in the nitrogen content: in melt L1 to L4, in which there was a precipitate within the ferritic grains, the content was substantially higher than in melt Z5 to Z8, which were devoid of any precipitate within the grains. This fact confirms the result of the earlier analysis that the nitride $(CrFe)_2N$ precipitates from δ-ferrite.* Instances were encountered where castings from the same melt deoxidized with a small quantity of aluminium, contained disintegrated δ-ferrite, but after deoxidation with a higher aluminium content the ferritic grains were devoid of intergranular precipitate (melts F1 to F4, D1 to D4, etc.). The phenomenon observed may again be explained on the assumption of a nitride origin of the precipitating phase. At the higher aluminium content its activity will rise at the expense of chromium, and the greater part of the nitrogen present will combine into very-stable aluminium nitrides. The concentration of residual nitrogen dissolved in the ferrite will fall below the critical limit, and no precipitation of chromium nitrides will take place during tempering. We have not found any argument which could prove a connection between the nitride-precipitate present and the impact strength. Nitrogen is in general a powerful austenite-forming element, and also suppresses the presence of ferrite; where the quantity of δ-ferrite is the same, the carbon content is therefore lower in steels with a greater nitrogen content.

Brittleness

The occurrence of crystalline fractures is dependent on the presence of δ-ferrite. A typical example is given by the fractures of melt Z17 to Z20. The crystalline fracture was manifested even in the impact tests in the quenched and tempered state. In view of what has been written above, a material with a crystalline fracture should not always be regarded as brittle.

Furnace Lining

Out of the metallurgical factors the lining does not play a fundamental part. The small differences in the impact strength values between melts Z1 to Z4 and Z13 to Z16 would rather speak in favour of an acid lining, since the fracture of melt Z13 to Z16 was finer. For melts Z5 to Z8 and Z17 to Z20 it was rather the other way round, and here in general the result was distorted by the low carbon content, and therefore by the somewhat higher content of δ-ferrite in melt Z17 to Z20.

Ferro-chrome

For melts Z5 to Z8 and Z17 to Z20 preheated FeCr was added to the furnace after the meltdown of the carbon charge. Considerable differences in hardness in the cast state and quantitative differences in the structure restrict the possibility of unambiguous comparison with melts Z1 to Z4 and Z13 to Z16. Melt Z5 to Z8 may rather be compared with melt S21 to S24, according to which it is more beneficial to add FeCr after the meltdown of the carbon charge. Remelting of chromium steel in an induction furnace has a favourable effect on the impact stength. We are convinced of this fact, though in fact we remelted a production melt from an arc furnace in the high-frequency furnace. The effect of remelting with and without further deoxidation is evident from Table 2.

TABLE 2.—*Effect of Remelting and Deoxidation on the Impact Strength of Arc-furnace Steel Melts.*

State of the material.	Average impact strength (kg.m. per sq. cm.).
As delivered material, quenched and tempered	3.6
Remelted material	5.3
Material remelted and deoxidised with Al 0.1 per cent.	4.7
Material remelted and deoxidised with CaSi 0.3 per cent.	6.8
Material remelted and deoxidised with ZrSi 0.4 per cent.	7.0

* J. Koutsky and J. Ječek, *Hutnické Listy*, 1958, **13**, No. 12, 1098 to 1105, or *Metal Treatment*, 1959, July/August, 264 to 272.

One is led to the conclusion that coarse-grain FeCr has a disadvantageous influence on the impact-strength values, on the one hand by the lower values of parts B of melt F1 to F4 as opposed to melt Z1 to Z4 (although parts C have an impact strength of the same order) and by the lower hardness of melt F1 to F4, which ought to benefit its impact strength according to other melts.

Deoxidation

Important and completely unambiguous information was obtained about the action of the individual deoxidation agents. It shows that deoxidation with a greater quantity of aluminium has a negative effect. This effect of aluminium is clearly manifested on tough castings with a mixed sorbitic-ferritic structure; on brittle castings its negative effect is not so obvious. A higher aluminium content also has an effect on the lower hardness in the cast state. Aluminium, as a ferrite-forming element, will increase the proportion of δ-ferrite in the structure. It is possible that a greater quantity of it in castings with a heterogeneous structure gives rise at some points to the occurrence of a supercritical quantity of δ-ferrite, which then lowers the impact strength. Reference has been made to the effect of aluminium on the precipitation within the ferritic grains. Deoxidation with CaSi has a favourable effect; the action of ZrSi by comparison with CaSi is less, and complex deoxidation with aluminium and ZrSi is not advantageous.

Heating

Further heating of the melt after deoxidation was shown to be favourable to melt T9 to T12, whereas the casting temperature in practice showed no influence on the impact-strength values, despite the fact that the individual castings were different in relation to their fracture surfaces. The higher is the casting temperature, the wider and more apparent is the zone of columnar crystallites.

A protective atmosphere of nitrogen showed no influence on either the notch-impact strength values or on the nitrogen content.

Wall Thickness

Within the framework of our study we investigated the properties of castings with two different wall thicknesses: 10 and 25 mm. The average hardnesses of the individual thicknesses in the cast state scarcely differ from one another; in the thinner walls it is slightly higher. The same applies basically to the impact-strength values; it is therefore impossible to show that the factor of the wall thickness would unambiguously influence the impact-strength values in any way.

Conclusions

Even though this study is far from exhausting all the factors* which can effect the mechanical properties of castings during their production, certain precepts can be presented which may be used for the production of high-chromium steel melted in high-frequency furnaces, namely:—(1)

* Further work by the same Author in Collaboration with F. Kinsky, on the "Effect of Metallurgical Factors on the Brittleness of 13-percent. Cr Steel Castings melted in Arc Furnaces," appeared in *Hutnické Listy*, 1960, pp. 524-528, a translation of which is available in English.

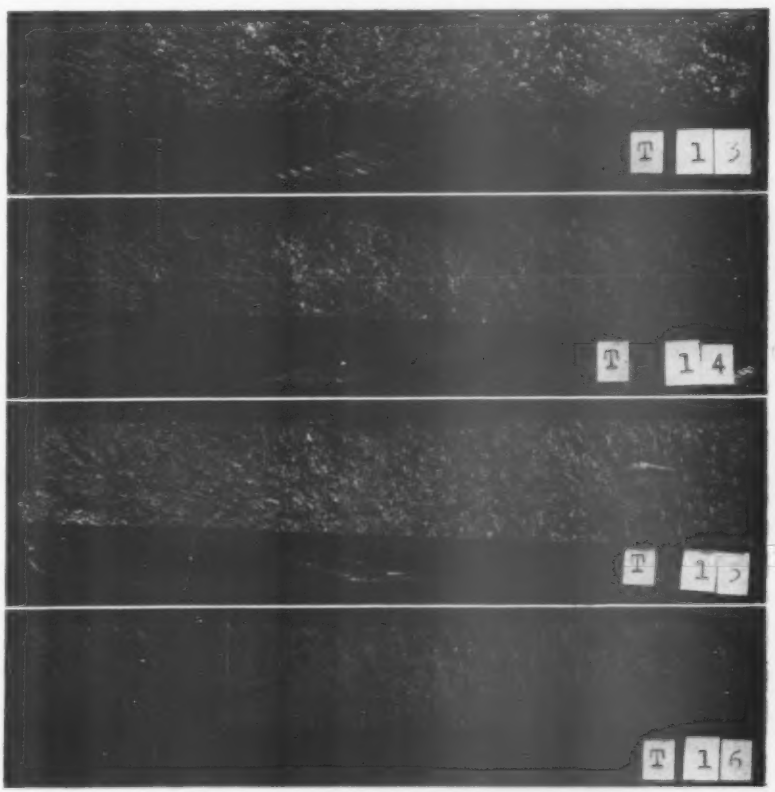


FIG. 29.—*Fractures of parts B of melts T13 to T16: casting temperatures, T13 1,660, T14 1,590, T15 1,480, T16 1,440 deg. C.*

Metallurgical Influences on Mechanical Properties of 13-per-cent. Chromium Steel

The chemical composition of the steel should be chosen with the minimum chromium and carbon content, so that the chromium and nickel equivalents shall be about equal. The presence of up to about 20 per cent. δ-ferrite in the structure is acceptable. (2) Preheated FeCr should be added after the meltdown of the carbon steel charge, and the melt worked as hot as possible. Preferably-fine-grain FeCr should be used. If the temperature of the melt is raised before tapping, this has a favourable effect. (3) Final deoxidation is most preferably carried out with CaSi. (4) These steels are not sensitive to the casting temperature within the limits of 1,580 to 1,480 deg. C. (5) Remelting, or the use of chromium steel scrap, improves the impact strength of the castings.

Acknowledgments

Thanks are due to Dr. F. Kinsky, Mr. F. Maran and Dr. Z Eminger for valuable suggestions for the experimental programme.

British Compressed Air Society's New Officers

Work abroad by UK constructional engineering firms amounted to £130,000,000 a year, said Mr. E. C. Beck, managing director of John Mowlem & Company, Limited, and chairman of the Council of the Export Group for the Constructional Industries, at the annual luncheon of the British Compressed Air Society in London on March 23. He referred to the great amount of plant, including compressed air equipment, required for any large contract.

Mr. E. A. Martin, whose two-year term of office as president ended later in the day, presided at the luncheon. In the evening, Mr. G. H. Hardy, of the War Office, spoke on the testing of air compressors required for arduous conditions.

The Council members of the Society for 1961-62 are: Ordinary council members: Mr. P. C. Bevis (Broom & Wade, Limited), Mr D. A. Hannay (Cooper-Stewart Engineering Company, Limited), Mr. E. A. Martin (Padley & Venables, Limited), Lt.-Col. K. Reavell (Reavell & Company, Limited), Mr. R. A. Rust (Joy-Sullivan, Limited), Col. R. W. W. Taylor (Lang Pneumatic, Limited), Mr. C. T. Wardman (Air Industrial Developments, Limited), Mr. J. M. Williams (Holman Bros., Limited); Associate council members: Mr. I. E. Graham (James Howden & Company, Limited), Mr. S. A. Gregory (A.E.I.-Birlec, Limited); Ex-officio council members: Immediate past-president, Mr. E. A. Martin; hon. technical director, Mr. T. C. Hore.

At the first meeting of the new Council, Lt.-Col. K. Reavell (Reavell & Company, Limited) was elected president, and Col. R. W. W. Taylor (Lang Pneumatic, Limited) was elected vice-president of the Society. Mr. T. C. Hore (Holman Bros., Limited) was re-elected hon. technical director, and Mr. H. S. Parsons (Consolidated Pneumatic Tool Company, Limited) was re-elected hon. publicity officer.

Edgar Allen's Executive Changes

A number of executive changes are announced by Edgar Allen & Company, Limited, steelmakers, engineers, founders, etc., of Sheffield. On Saturday, April 1, Dr. Edwin Gregory and Mr. Bernard Blackwell Green, directors, reinquished the full-time executive positions as chief metallurgist and general sales manager, respectively, but will continue as non-executive directors and to serve the company in a consultative capacity.

Having regard to the impact of increasingly complex trading conditions, the board has decided that its "executive" members should be relieved of responsibility for day-to-day management of production or other departments so that they may devote more attention to wider issues of policy, development, and expansion. Executive responsibilities have therefore been allocated as follow:—Mr. W. H. Higginbotham, chairman and chief executive; Mr. J. Higginbotham, all commercial activities; Mr. W. G. A. Jenkins, foundry and steel melting, steel, saw, magnet, works engineering and ancillary operations, operational research; Brig. A. Levesley, marketing; Mr. W. J. McBride, engineering (including machining), trackwork, engineers' tools, development and research; Mr. F. A. Ross, secretary and chief accountant.

Consequent senior managerial appointments are:—Mr. W. H. Everard, manager foundry and ancillary departments; Mr. J. D. Studholme, manager, engineering department; Mr. F. Haigh, sales manager.

ICI Board Appointments

Successor as technical director of Imperial Chemical Industries, Limited, to Dr. Richard Beeching, who takes over as chairman of the new British Railways board on June 1, will be Mr. Harold Smith, at present chairman of ICI's general chemicals division. He has been with the company since 1929.

Mr. M. J. S. Clapham becomes overseas director of ICI in place of Dr. J. S. Gourlay who is to be Group "A" director, alkali and general chemicals. Mr. Clapham started with ICI in 1938 in the metals division, being seconded to the Tube Alloys (Atomic Research) organization for the war years. He became chairman of the metals division in January, 1960.

Institute of Metals' New Secretary

The appointment of a new secretary of the Institute of Metals to succeed Lieut.-Colonel S. C. Guillan, T.D., who retires on May 1, is announced. He is Mr. R. E. Moore, who has been assistant secretary since 1947. Mr. Moore was born in India and educated at Tonbridge School. For four years before the second world war he worked with a firm of solicitors and in 1939 joined the Royal Artillery as a gunner, being demobilized in 1945 with the rank of major. In 1946 Mr. Moore became assistant to the Registrar of the Institution of Metallurgists before joining the Institute of Metals in 1947 as assistant secretary.

LORD BRECON, Minister of State for Welsh Affairs, will open the conference on the problem of communications between science and industry organized by the Department of Scientific & Industrial Research at the Brangwyn Hall, Swansea, on April 18. Accommodation is limited, and those who wish to attend should apply without delay to Mr. E. E. Williams, Liaison Officer in Wales, DSIR, Block 2, Government Buildings, Gabalfa, Cardiff.

British Bronze & Brass Ingot Manufacturers' Association

Report on Annual General Meeting, held in Birmingham

The fifteenth annual general meeting of the British Bronze & Brass Ingot Manufacturers' Association was held on March 21 at the Queen's Hotel, Birmingham. In the "business" part of the meeting, all the retiring officers were re-elected with the exception of members of Council, where Mr. W. E. Laybourne had not wished to accept re-election owing to pressure of other duties. The officers for the coming year are therefore as follow: As *president*, Mr. J. H. Barwell, J.P., as *vice-president*, Mr. J. N. Cohen, as *members of Council*, Mr. R. Anderson (E. Chalmers & Company, Limited), Mr. J. E. Bush (Metal Products Company (Willenhall), Limited), Mr. E. Josephs (Leopold Lazarus, Limited), Mr. J. E. Stevenson (John Allan & Company (Glenpark), Limited, Mr. J. H. Barwell; Mr. J. N. Cohen, and Mr. R. Wood (Wolverhampton Metal Company, Limited). The *auditors* (Kemp, Chatteris & Company) and the *secretaries* (Heathcote and Coleman) were also re-elected.

President's Report

Before presenting his report, the president, Mr. Barwell, said that Brookside Metal Company had taken over the membership of H. B. Barnard & Sons, Limited, and M. Henderson Clark, Limited, and McKechnie Bros., Limited, had resigned. What follow are extracts from the president's report in so far as it concerned matters of general interest:—

Export Trade

Mr. Barwell said that the export of ingots had continued at a good rate after falling off in July, August and September, the total for 1960 of 29,422 tons being slightly lower than for the previous year. Turning to the export of scrap, the president said that the Board of Trade continued to weigh the position very carefully. During the year, the Government announced that it was prepared to consider applications for the export of scrap arising from shipbreaking; this was subject to a very strict procedure and as far as the Association was aware, little or nothing had been exported from this source. In recent months particularly, there had been a general shortage of scrap in the country with consequent high prices, and it was evident that this country could not afford to export scrap. It also seemed quite clear that prices of metals and scrap in many countries—even apart from Japan—were still subject to political and fiscal policy influences, which meant that to open the country's doors to the export of scrap would submit the industry to unfair competition.

Promotion of Copper-alloy Castings

Mr. Barwell said that the founders' associations had approached the British Bronze & Brass Ingot Manufacturers' Association and discussions had taken place on the promotion of the use of copper-alloy castings. Following discussions recently with the Association of Bronze & Brass Founders on this matter, there were prospects of co-operating with them, starting on a technical level. Although it was felt that founders were the customers of the ingot makers and the cost of promoting the use of castings should be assumed largely by the foundry industry, research leading to better alloys as a means of making better castings was something which should yield benefits to ingot makers. Mr. Barwell said the industry would like to see greater use of ingot and less use of scrap by founders, and an article had been prepared on this subject by their technical committee and would be sent out to holders of the *Ingot Manual* at the time a new specification section for the *Manual* was issued.

*BS.*1400

Mr. Barwell said that the revised standard (BS.1400) for copper-alloy ingots and castings would appear this year. It had taken a number of years to revise this standard and the new issue was necessarily a compromise between widely-differing points of view. The Association had endeavoured to retain reasonably practical and economic composition limits, especially with regard to minor impurities.

Smoke and Fume Abatement

The president said that the Association's sub-committee dealing with smoke and fume abatement had established very good relations with the Alkali Inspectorate, and a meeting had been held with the chief inspector and local inspector in Birmingham on March 9. Mr. Peter Mould would be reporting later to members and circulating notes on the meeting which would clarify the Inspector's requirements in respect of the Alkali Act.

Electrolytic Manganese

By representations to the Board of Trade and by co-operating with other bodies representing users of electrolytic manganese, the president said that the proposed reimposition of key-industry duty on this metal had been deferred until June 30, 1961. It was hoped that the duty would be rescinded in due course.

Finally, Mr. Barwell referred to the loss the Association had suffered during the year by the death of Mr. F. Baugh. He had been a member of Council since the inception of the Association, and president for two years. The industry and the Association owed a great deal to his efforts.

Technical Report

The chairman of the technical committee, Mr. E. J. Turner, submitting his report, stated that the committee had held three meetings during

BBIMA Annual General Meeting

the past year, and the main subjects dealt with were as follow:—

BS. 1400

The revision of BS. 1400 had reached its final stages and was expected to be finally approved and published shortly. The general principle had been that individual impurity-limits should not be specified unless there was evidence that contents in excess of these limits were harmful and also until analysis methods for such small quantities were available; further that the ingot manufacturer should not be required to supply detailed analysis figures for these "other impurities." In many of the specifications as set out in the final draft, there was a total only for "other impurities", and in many others, they were limited to silicon, bismuth, aluminium, and iron plus arsenic and plus antimony. Furthermore, the chairman stated that the foreword made it clear that for these the supplier would not be called upon to supply detailed analysis figures, but was to satisfy himself by his own quality-control methods that the limits for these elements were not exceeded. The chairman recorded thanks to Mr. Edge who had been the Association's spokesman on the BSI Committee dealing with this matter. He had had a difficult task and the Association's thanks were due to him for undertaking the work and for seeing it through to a satisfactory conclusion.

Methods of Analysis

When detailed impurities were proposed for BS. 1400 alloys, the chairman reported that his technical committee had pointed out that these were impracticable until methods for analysis, appropriate to the specifications proposed were available. As a result, the Sampling and Analysis of Copper Alloys Committee of the Association was set up in 1957 and had since done a great deal of work, resulting in the publication in 1960 of Methods for the Analysis of Copper Alloys BS. 1748, parts 6, 7 and 8, tin, silicon and phosphorus, and recently, parts 1 to 5, copper, lead, iron, aluminium and nickel. Work was proceeding on methods for zinc and would be followed by methods for arsenic, bismuth and antimony and modifications to suit different groups of alloys. The Association was fortunate in having Mr. J. E. Bush to serve on this committee. There had been a great deal of work to be done in evaluating methods proposed and in this Mr. Bush had played his full share and had given a great deal of his time (with the support of his company who had gone to considerable expense in providing materials and equipment) and thanks were due from the Association.

Scrap or Ingots

Mr. Turner wrote that at the request of the Council, the technical committee had prepared an article, setting out the reasons for which ingots were to be preferred to scrap for the making of castings and this, as stated by the president, would shortly be distributed.

Membership

Finally, Mr. Turner reported that the committee were sorry to lose the services of Mr. A. E. Cohen and wished him a happy retirement, and of Mr. S. Edge, owing to his other commitments, and he recorded a vote of thanks for the excellent services they had both rendered. He said he was pleased to welcome Mr. Hipwell (of Wolverhampton Metal Company, Limited) to the committee. Finally, Mr. Turner referred to his own retirement and while explaining his reasons, made a plea for each member-firm having a suitable man on its staff to nominate him to serve on the committee.

A vote of thanks to Mr. Turner for his report and for all the work he had put in over a long period was initiated from the chair and warmly supported by members present. It was stated that consequent upon Mr. Turner's resignation a new chairman for the Association's technical committee would shortly be elected.

(This concluded the matters dealt with at the meeting which are of general interest to readers—EDITOR.)

Management for Exports

The 1961 Scottish Conference of the British Institute of Management which will be mainly concerned with export management, is to be held at Gleneagles on April 21 and 22.

The director of European Productivity Agency, Mr. R. Gregoire, will open the conference at 5 p.m. on April 21 with a paper on "Management Training in a Changing World." The whole of Friday evening will be devoted to informal discussion groups when the delegates will have the opportunity of examining in detail mutual problems and experiences. On April 22, the Consul General for Denmark, Mr. H. Hjorth-Nielsen, will consider "The Problems of Economic Co-operation in Western Europe," and in another paper Mr. J. E. V. Tyzack, C.B.E., chairman, John Tyzack & Partners, Limited, will discuss "Exports —Vocation or Profession." Sir James R. H. Hutchison, BT., D.S.O., T.D., J.P., president, The Association of British Chamber of Commerce and chairman of Glenfield & Kennedy, Limited, in his address at the closing dinner will examine the whole field of management for exports.

ISHRA Companies' 1960 Results

Details of accounts for the year ended October 1, 1960, for the companies within the Iron and Steel Holding and Realization Agency, are as follows:—Bairds & Scottish Steel, Limited, manufacturing and trading profit £848,305 (£292,709), net profit £143,298 (£84,922). Ordinary dividend 10 (4) per cent. John Baker & Bessemer, Limited, group manufacturing and trading profit £220,466 (53 weeks £220,915), net balance £69,177 (£91,307). Ordinary dividend 15 (20) per cent.

Barrow Ironworks, Limited, manufacturing and trading profit £326,930 (53 weeks £312,844), net balance £36,066 (£70,995). Dividend 3 (5) per cent. Barrow Steel Works, Limited, manufacturing and trading profit £62,898 (loss £88,998 for 53 weeks), balance £39,792 (loss £235,362). Gjers, Mills & Company, Limited, manufacturing and trading profit £135,918 (£106,660), net profit £64,847 (£45,782) plus £3,271 (£4,466) tax written back. Dividend 8 (same) per cent.

ISHRA has published the accounts of its companies in volume form for the year ended October 1, 1960. Copies are obtainable on application to the agency at 1, Chester Street, London, S.W.1; 7s. 6d. (post paid).

SECTION DEVOTED TO THE TECHNOLOGY OF PRODUCING DIMENSIONALLY-ACCURATE CASTINGS

Pressure-die-casting of Complicated Aluminium-alloy Castings*

By D. P. Tatanov and N. V. Kuranova

A large number of components of the automatic hydraulic transmission of the "Volga" car are produced from aluminium alloys, amongst which are twelve components weighing from 0.03 to 4 kg., by the method of pressure-die-casting (Fig. 1). The majority of these have a complicated outline, and castings generally must possess adequate rigidity, wear resistance to abrasion, oil pressure-tightness at 12 atm. and 120 deg. C., and a cleanliness of the surfaces to be machined of not less than grade 8,† while preserving accuracy of the dimensions of grade 2.

During the development of the production of the components, great attention was paid to the question of the choice of an aluminium alloy, which would permit the production of castings with the required service properties.

Alloy Selected

As is well known, aluminium alloys containing silicon (Silumin) have excellent casting properties, but they are very tough, while alloying elements which improve the machinability have a deteriorating effect on casting properties. After research had been carried out, an alloy was selected with a composition: Cu 1.5 to 2.0; Si 7.0 to 9.5; Mg 0.20 to 0.35; Fe 0.5 to 1.5; Zn <1.0; Mn <0.5; Ni <0.5 per cent., and balance aluminium. This alloy has the following mechanical property values: tensile strength 40 to 42 kg. per sq. mm. (25 to 27 tons per sq. in.); elongation 0.4 to 0.6 per cent.; notch-impact strength 0.15 to 0.16 kg-m. per sq. cm.; and Brinell hardness 100.‡

The mechanical-property values were determined on specimens cut from a test-piece, 150 by 150 by 15 mm., cast in a metal mould. The tensile specimens were prepared with a diameter of 10 mm., a gauge length of 50 mm., and the impact specimens to dimensions 10 by 10 by 60 mm. with a notch, the specimens being aged at 175 deg. C. for a period of 24 hours before being tested. These conditions for ageing treatment were established by experimental means for the stabilization of the dimensions of the components. The free linear shrinkage of the alloy is 1.27 per cent., and the actual casting shrinkage averages about 0.5 per cent. The alloy has good casting properties during the casting of components with a complicated outline, and ensures the production of the required surface cleanliness during machining. The casting temperature is within the limits of 590 to 620 deg. C., dependent on the outline of the component and the power capacity of the die-casting machine. The preparation of the components for the automatic hydraulic transmission of the "Volga" car was planned on "Polak" continuous-casting machines in batches of 600, 900 and 2,255 units.

In the choice of the point of delivery of the feed to the castings, account was taken of the problem of producing directional movement of the metal, and frontal impacts were eliminated. The thickness of the feed was chosen at 2 to 2.5 mm.

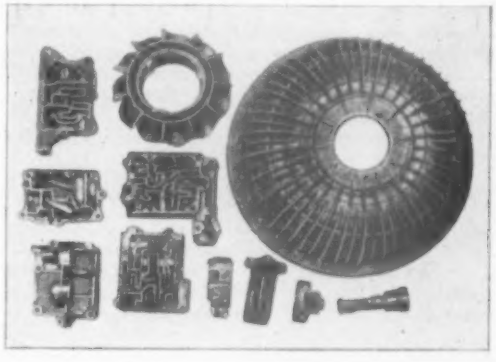


FIG. 1.—*A few of the quite complicated designs of automobile components now produced in Russia as pressure-die-castings.*

Design Problems

In the designing of the pressure-casting dies the task presented itself of producing castings with a minimum requirement of subsequent machining, and so far as possible, of producing all channels and apertures by casting. Thus, for instance, the body of the controller of the change-over switch is cast with 34 apertures, with diameters from 3 to 19 mm. and 33 separate closed channels of differing shapes; the body of the impeller of the hydraulic-transformer pump has 124 small compartments, distributed evenly in three rows around the concave-spherical surface. Withdrawal of the cores and

* Extracted from *Liteinoe Proizvodstvo*, 1959, No. 8.

† Presumably, a Russian standard for castings acceptance—EDITOR.

‡ The tensile strength given in the original text was 40 to 22 kg. per sq. mm., but this is taken as a misprint for 40 to 42 kg. per sq. mm.—EDITOR.

Pressure-die-casting of Complicated Aluminium-alloy Castings

knocking out of the castings from the pressure-casting dies, is for the most part carried out by means of a hydraulic-drive mechanism, which is more reliable than a mechanical system—especially where there is considerable movement of the cores. The pressure-casting dies are treated with a weak solution of sodium fluoride at 150 to 200 deg. C. In the majority of instances the die paint is applied by spraying before each casting operation.

The allowances for milling and subsequent lapping of the surfaces are equal to 0.5 to 1 mm. on the side. On the apertures under the slide valves, which are machined in four operations (with a drill, a countersink and preliminary and finishing reamers) the allowances are 1.0 to 5 mm. on the diameter.

Production Troubles

During the development work the most difficult of all were three components—the body of the controller of the change-over switch, the body of the feed controller, and the top cover. Casting of these components was carried out on a "Polak" 900 machine. On the castings porous areas and incomplete formation of the thin ribs occurred. Frequently after the pressing of the metal, the die did not open. After the machining of the components on the milled surfaces no cavities were revealed, but after deep-drilling and subsequent-finishing operations, especially in the areas of increased cross-section, where it was impossible to produce the apertures by casting because of design considerations, on all the components cavities up to 3 mm., and even more, in diameter were disclosed.

Casting Density

In order to improve the density of the castings their production was switched to the "Polak" 2255 machine. For this purpose a compression chamber, 80 mm. in diameter, was prepared and fitted to the machine, which made it possible to increase the specific-pressure for pressing the metal up to 1,090 kg. per sq. cm., *i.e.*, twice the pressure obtainable on the "Polak" 900 machine. This made it possible to diminish porosity sharply in the castings, and their weight was increased by 10 to 15 per cent. Experience in the pressure-die casting of complicated castings shows that components having narrow channels, and ribs of tortuous shape, can be produced of better quality, if the rate of filling of the casting dies with metal is decreased.

A TRADE DELEGATION, jointly sponsored by the Board of Trade and the Federation of British Industries and organized by the FBI will leave in April 11 to visit seven countries in South-East Asia, under the chairmanship of Sir Edward Thompson. The delegation will work through four simultaneous missions covering Malaya- Singapore; Thailand-Burma; Philippines-North Borneo, and Indonesia.

BICTA's Third Annual Conference

The British Investment Casters' Technical Association has released the following details of the programme for its third annual conference to be held at the Connaught Rooms, Great Queen Street, London, W.C.2, from Monday, May 15 to Wednesday, May 17. The technical sessions will be rather longer than those of last year, otherwise a similar programme has been adhered to. Ample time is being allowed for discussion of the papers. The Association is pleased to welcome to the conference guest authors Mr. Frank Nixon, of Rolls-Royce, Limited, and Mr. R. J. E. Glenny, of the National Gas Turbine Establishment. The exchange papers from the USA, which are always popular, will be given by Mr. Roger Waindle and Mr. George E. Tubich.

Monday, May 15

The Conference will begin at 2.30 p.m., with the annual general meeting, and at 3 p.m., the reports of the various technical committees will be presented for discussion. In the evening, 7 to 8.30 p.m., there will be a cocktail party for members and ladies.

Tuesday, May 16

9.30 *a.m.* Technical session No. 1 under the chairmanship of Mr. G. A. Tomkinson will comprise presentation and discussion of "Silica Binders for Shell-investment Casting" by Dr. E. J. Shepherd and Mr. N. Lewis (Monsanto Chemicals, Limited).

10.45 *a.m.* Technical session No. 2, chairman Mr. D. H. Armitage, and presentation of the paper "Polystyrene in Investment Casting," by Mr. J. Payne (Monsanto Chemicals, Limited); followed by "Health and Safety in the Investment Foundry," by Mr. G. E. Tubich (Michigan Department of Health).

2.30 *p.m.* Technical session No. 3, chairman Mr. R. W. N. Danielsen, to consider: "Control of Product Quality," by Mr. F. Nixon (Rolls-Royce, Limited).

3.45 *p.m.* Technical session No. 4, chairman Mr. W. Foyers, for a paper "Dynamic Accountancy," by Mr. E. A. Ede (Deritend Precision Castings, Limited). The session will adjourn at 4.45 p.m.

7.30 *for* 8 *p.m.* Annual dinner of the Association at which Sir Miles Thomas (chairman of Monsanto Chemicals, Limited) will be principal guest.

Wednesday, May 17

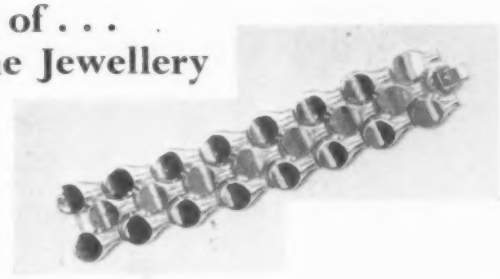
9.30 *a.m.* Technical session No. 5, chairman Mr. N. Walker, with "Recent Developments in Alloys for Gas-turbine Rotor Blading," by Mr. R. J. E. Glenny (National Gas Turbine Research Establishment).

10.45 *a.m.* Technical session No. 6 (chairman, Mr. L. S. Taylor) for "Tensile Ductility and Stress/Rupture Properties of Investment-cast Nimocast 90: part 1," Mr. G. F. Smith (Hadfields, Limited) and part 2, by Mr. R. M. Cooke and Mr. P. J. Penrice (International Nickel Company (Mond), Limited), followed by "Reliability of Steel Castings," by Mr. Roger Waindle (WaiMet Alloys Company, USA).

The conference will conclude after luncheon at 1 p.m. with the chairman's closing remarks and announcement of the Association's new chairman.

The Association is again inviting non-member investment casters to participate in the conference and ladies are invited to attend the evening functions. The secretary, Mr. E. G. Donaldson, B.SC., A.I.M., requests that registration forms be completed and returned to him at 5, East Bank Road, Sheffield, not later than April 17. Tickets and preprints of conference papers will be issued in advance to those who register.

Die-casting of . . . . . Costume Jewellery



Examples of the Foundryman's Art translated into Highly-mechanized Production

Mass-produced articles enable the average modern woman to dress in a style, which, not-so-long ago, only the more well-to-do would have been able to afford. Contributing to a considerable extent to her grooming is low-cost costume jewellery, die-cast in delicate patterns from zinc-alloys. One of the firms specializing in this work in America and designing and producing many attractive styles is the Arden Jewellery Manufacturing Company, Providence, R.I. This firm produces bracelets, necklaces, belts, pins and ear-rings and was one of the first to use zinc-alloy die-casting for mass-producing jewellery. A good-looking die-cast bracelet (as shown in the illustration in the heading) made by this method is sold in America at $1. Made by other methods it could cost up to $50.

Production

When a particular piece of jewellery is conceived perhaps 10 different sketches of the one item are prepared and considered. From these one design is finally selected which is not only attractive but practical from the manufacturing point of view. The design is then produced as a model which itself is made into a steel "hob" or "hub." (Fig. 1.) This hob is slowly and carefully pressed into eight steel die-inserts under many tons of pressure and these are machined, hardened, and set (Fig. 2) into a steel die-set. At this stage ingates are cut from the sprue to each insert. Following machining and assembly, the die is installed in a water-cooled die-casting machine which operates at 200 casting cycles an hour (Fig. 3), at a temperature of 395 to 400 deg. C. The casting metal used is Di-Metal No. 3, a zinc alloy made by Asarco's Federated Metals Division. After cooling, the sprays are taken to the power-press department where individual castings are trimmed out. This is done with a trimming tool (Fig. 4) designed to coincide with the finished casting shape. Simultaneously with the trimming process an inspection takes place.

FIG. 1.—*The design selected from the preliminary sketches—combining decorative appeal with ease of manufacture—is worked into a steel "hub" or "hob."*

FIG. 2.—*The "hub" or "hob" is pressed into eight steel die-inserts which are machined and set into a steel die-set. Runners and ingates are then cut from the sprue to each insert.*

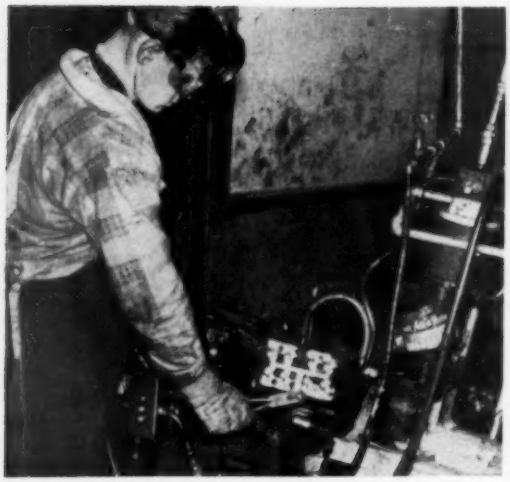


FIG. 3.—*A spray is here being removed from the water-cooled die-casting machine which operates at approximately* 200 *shots per hour.*

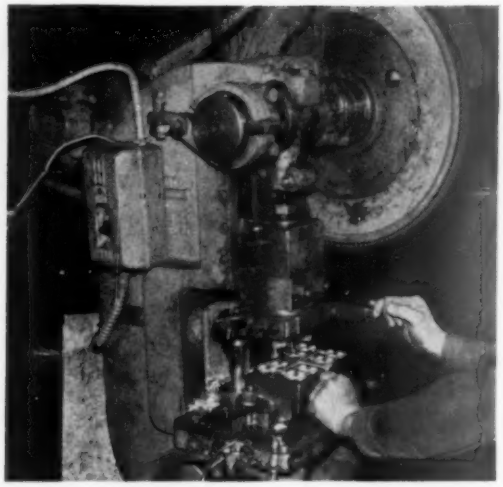


FIG. 4.—*"Fettling" is carried out with a trimming tool that presses the separate castings to their individual shapes.*

The pieces are then deburred in barrel tumbling machines.

Finishing

Final processing starts with the foot-press department where the castings are assembled into necklaces, bracelets, belts or ear-rings. The methods of assembly include self-connecting by swaging a metal tab over a stud, the use of metal connecting links, or by interlocking the castings into each other and staking.

After assembly, the raw-jewellery items are sent into the plating room where they are polished, degreased and either electro-plated or vacuum-plated, before being finally inspected and sent for packing and despatch.

SCOW Appointments

New appointments announced by the Steel Company of Wales, Limited, include that of Mr. Godfrey Walker who becomes public relations officer . He will be based at the London Office, Margam House, St. James's Square, and in his new position he will have the additional duties of advising the chairman and the sales controller on matters affecting prestige and commercial advertising. Mr. Walker joined the company in 1947 as information officer at Port Talbot.

Mr. Wendell Leyshon, assistant information officer, has been appointed information officer and will take over the duties formerly carried out at Port Talbot by Mr. Walker. He joined the company in 1934.

Latest Foundry Statistics

Light-alloy Castings: At last the Ministry of Aviation has announced last year's production of aluminium castings. The JOURNAL'S estimate that for the first time it would top 100,000 tons has proved to be correct. The actual figure is 103,658 tons, made up of 21,203 tons from sand moulds; 55,458 tons of gravity-die and 26,997 tons of pressure-die-castings. The production of magnesium castings totalled 2,201 tons. This is the last time that the Ministry will issue these statistics; their provision in the future will be in the hands of the Aluminium Industry Council and the Magnesium Industry Council.

Simon Engineering and W. S. Barron

Offer for the whole of the preference and ordinary capital of W. S. Barron & Son, Limited, milling engineers and ironfounders, of Gloucester, with the exception of the 31 per cent. of the ordinary share capital which is already owned by Henry Simon (Holdings), Limited, has been made by Simon Engineering, Limited, and has been accepted.

The consideration in the case of the preference is £7,500 cash, and in the case of the ordinary, of 170,709 ordinary 5s. shares of Simon Engineering, on the basis of three Simon shares for each two £1 ordinary Barron shares.

NSMP Works Visits

Arrangements have been made by the National Society of Master Patternmakers for a morning visit to the shipyard of Cook, Welton & Gemmell, Limited, Grovehill, Beverley, Yorkshire, on April 18, commencing 10.30 a.m. Following luncheon at the Beverley Arms Hotel, the party will go on to the works of Priestman Bros., Limited, manufacturers of excavators, cranes, etc., at Hedon Road, Hull. Both visits are open to members and their friends, and those wishing to participate are asked to complete forms and return them to the secretaries, Fisher & Firkins, 12, Cherry Street, Birmingham 2, not later than April 11.

Equipment and Supplies

Recirculating Ovens

G. & R. Gilbert (Industrial), Limited, Hackbridge Road, Hackbridge, Surrey, have recently increased their range of standard ovens for stoving, drying, curing, pre-heating, baking, etc., by including a new series of recirculating ovens with three forms of heater and 36 standard sizes. Fig. 1 shows a direct gas-fired unit from this range, showing the heater and fan-assembly mounted on top of the oven. This arrangement occupies the minimum amount of floor space, but where headroom is limited, the heater may be placed at floor level on one side of the oven. The firm also manufacture electrically-heated ovens which have a series of metal-sheathed magnesium-oxide or steatite-insulated heater-elements fitted into an insulated steel casing. The sectional construction used for the ovens permits installation in buildings with restricted access and allows of widths of 5 ft., 6 ft., and 7 ft., and heights of 6 ft. 6 in., and 7 ft. 6 in. to be built up in 4-ft., 5-ft., 6-ft., 8-ft., 10-ft. and 12-ft. depths. Larger ovens and steam or oil-fired units employing basically standard sections can be built up to order.

Moulding Machine

Ernest Fairbairn, Limited, 376/379, Strand, London, W.C.2, announce that their principals, Kuenkel, Wagner & Company, have extended their range of simultaneous jolt/squeeze/pin-lift machines, type A.P.M.s to include size 4. This new model has a squeeze pressure of 44,000 lb., useful load of jolter of 2,200 lb., and a lift of 8½ or 16 in. The machine

FIG. 1.—*Direct gas-fired oven made by G. & R. Gilbert (Industrial), Limited, showing the heater and fan-assembly mounted on top of the unit—one of a new series of recirculating ovens added to the company's range.*

FIG. 2 (*above*) *illustrates an intricate pattern recently cast in "Araldite"* epoxy resin by J. Hobkirk Sons & Company, Limited, of Bedford (along with a casting made from it). The pattern is for the manufacture of bodies for a rotary-compressor unit for Cooper-Stewart Engineering Company, Limited, of Letchworth. It is claimed that a great saving in time results from the use of the resin, as a pattern produced from an aluminium casting requires a great deal of cleaning-up before use. Better wearing properties are also expected from the non-metallic pattern.*

* Produced by CIBA (A.R.L.), Limited, Duxford, Cambridge.

is shockless and hence no foundations are required, and it can be supplied for either manual, semi- or fully-automatic control. Manual operation is arranged from a ball-and-socket type control, which starts each movement individually. Spares for the new machines in this country are kept by Ernest Fairbairn, Limited (as too are spares for the other range of machines made by Kuenkel, Wagner & Company).

Peat Flour: Harborough Construction Company, Limited, Market Harborough, Leicestershire, announce a sales agreement with Richardson's Moss Litter Company, Limited, for handling of Castex peat flour. This is a comparatively newly developed material for adding to greensand when preparing it for moulding, especially for iron castings. It is claimed that it ensures freedom from scabs, rat-tails, burning on, etc. To retain the properties of the peat, it is being supplied in moisture-proof paper-sacks. Further information about the flour is given in the company's leaflet No. 18.

Shellmoulding Equipment: Foundry Suppliers, Limited, 25a, Cockspur Street, London, S.W.1, announce that they have taken over the sole agency for the sale of Anson shellmoulding equipment, manufactured by Anson Units, Limited, Methley Road, Whitwood Mere, Castleford, Yorks. This equipment includes the firm's model "200" coremaking machine, model "40" shellmoulding machine and the Anson shell-mould closing press.

Tool-tipping Material: A new tungsten carbide, known as SI Premium, developed by the Swedish Sandvik concern, has now been patented in Great Britain and is obtainable from Sandvik Swedish Steels, Limited, Halesowen, Birmingham.

Company News

Hadfields, Limited

Paradox of a falling-off in the demand for steel supplies at the same time as there had been increased activity in the motor-car industry, was referred to by Lord Dudley Gordon, chairman of Hadfields, Limited, steel manufacturing and engineering group, at the company's annual meeting on March 24. It was quite possible, he said, that this might be partly due to what had been referred to as "stock fluctuations" by the president of the British Iron and Steel Federation, Mr. C. R. Wheeler, in his recent annual review of the industry.

Apart from this particular case, said Lord Dudley Gordon, orders in hand both with the parent company and the Millspaugh, Limited, subsidiary could be looked upon as satisfactory at present. It had been reported that in the closing stages of the Leipzig spring fair, a contract was signed by the agents of Millspaugh for cardboard-making machinery to the value of £425,000. It should be understood, the chairman said, that this was one of those cases which was not yet fully completed.

BRITISH BELTING & ASBESTOS, LIMITED—Whole of its interest—17,000 ordinary £1 shares out of a total of 17,650—in George Sampson & Son, Limited, has been sold to Charles Walker & Company, Limited, of Leeds.

BROOM & WADE, LIMITED, air compressor manufacturers, of High Wycombe (Bucks)—A one-for-six rights issue of 1,250,000 ordinary shares at 22s. 6d. per share will be made to ordinary stockholders registered on March 24.

WHEWAY, WATSON & MCLEAN, LIMITED, chain manufacturers, etc., of Walsall (Staffs)—The dividend of 20 per cent. on £140,000 for 1960 compares with 25 per cent. for 15 months on £70,000. Group profits were £58,532 (£52,120 for the period).

R. W. CRABTREE & SONS, LIMITED, manufacturers of printing machinery, of Leeds—Group profit expanded from £375,947 to £448,594 and the dividend is raised by 2 per cent. to 10 per cent. After tax of £223,788 (£202,744), the net balance is £224,806 (£173,203).

MILES DRUCE & COMPANY, LIMITED—Final dividend of 12½ per cent. on the capital as increased by a one-for-four rights issue is recommended, making the total for 1960 22½ (16⅔ equivalent) per cent., adjusting for a 50 per cent. scrip issue. Group profit, before tax, is £359,790, compared with £206,464.

TONKS (BIRMINGHAM), LIMITED, brassfounders, etc.—A conditional agreement has been entered into the acquisition of Walter Rowley, Limited, non-ferrous founders, also of Birmingham, for £360,000. Of the consideration £120,000 will be satisfied in cash and £240,000 by the issue of 300,000 Tonks 5s. shares at 16s. per share.

JOHN G. STEIN & COMPANY, LIMITED, makers of firebricks, refractories, etc., of Bonnybridge (Stirlingshire)—Net profits for 1960 expanded from £380,810 to £674,386, and a final dividend of 7½ per cent. makes 12½ per cent. on the ordinary shares, against 10 per cent. previously. The net profit is after a tax charge of £630,000 (£353,000).

SAMUEL OSBORN & COMPANY, LIMITED—Interim dividend in respect of the year to July 31, 1961, is being raised to 15 (10) per cent. and forecasts are for a final of not less than 25 per cent. A total of 35 per cent. was paid for 1959-60. The directors state that at present orders on hand for the main activities are good, and, in some cases, heavy.

HALL ENGINEERING (HOLDINGS), LIMITED—Group turnover reached over £12,000,000 for 1960 and profit, before tax, at £1,022,563, exceeded £1,000,000 for the first time. A final dividend of 10 per cent. makes 17½ per cent. on capital increased under the acquisition of Perfecta Motor Equipments, Limited, compared with 12½ per cent. on the old capital previously.

GEORGE ANGUS & COMPANY, LIMITED, power transmission, fire, gear and fluid sealing engineers, of Newcastle-upon-Tyne—Group trading surplus expanded from £766,000 to £1,121,000 for 1960. The final dividend is raised from 10 per cent. to 12½ per cent., making a total of 20 (15) per cent. After all charges, group net profit has increased from £372,000 to £547,000.

Forthcoming Events

APRIL 10

Institute of British Foundrymen

Sheffield branch: "Cost Control in the Foundry," by D. A. Crooks, 7 p.m., at the Grand Hotel, Sheffield.

APRIL 11

Combustion Engineering Association

Northern region: "Operation and Incentive Schemes applied to Shell Boiler Installations," introductory survey by H. E. Pearsall, followed by lecture on results of incentive schemes by H. Pollard, 2.30 p.m., at the George Hotel, Huddersfield.

Institute of British Foundrymen

Coventry & district section: Annual general meeting followed by a technical film show arranged by Foundry Services, Limited, 7.30 p.m., in Room A5 of the Technical College, The Butts, Coventry.

Slough section: Annual general meeting, followed by a film evening, 7.30 p.m., at the Lecture Theatre, High Duty Alloys, Limited, Buckingham Avenue, Slough.

APRIL 12

Institution of Chemical Engineers

One-day symposium on "Materials of Construction," 9.30 a.m. to 5.30 p.m., at the Chemical Engineering Department, University of Birmingham, Edgbaston, Birmingham.

APRIL 13

Institution of Plant Engineers

Glasgow branch: "Plant Records"—a consortium of committee members will present data on their established systems, 7.15 p.m., at the Scottish Building Centre, 425, Sauchiehall Street, Glasgow, C.2.

Institute of British Foundrymen

Beds & Herts section: Annual general meeting followed by "Making of Malleable Chain," by R. Leeks, 7.30 p.m., at Bagshawe & Company, Limited, Dunstable. (Note: This represents a change of venue and programme from that announced in the section's programme booklet.)

Lincolnshire branch: Annual general meeting followed by "Avoiding Unnecessary Maintenance," by W. B. Ford, 7.15 p.m., at the Technical College, Cathedral Street, Lincoln.

APRIL 14

Wales & Monmouth branch: Annual dinner/dance. (Details from secretary.)

APRIL 15

Lancashire branch: Annual general meeting followed by presentation of the winning paper in the John Wilkinson memorial medal competition. The film "To Meet the Challenge" will follow and after this a review of the work of the technical committee will be given by G. Southern, 3 p.m., at the Midland Hotel, Manchester.

West Riding of Yorkshire branch: Annual general meeting, 6.30 p.m., at the Bradford Institute of Technology.

DSIR and Communication Problems

"The Problem of Communication between Science and Industry" will be the subject of a conference organized by the Department of Scientific and Industrial Research, to be held at the Brangwyn Hall, Swansea, on April 18 and 19. The opening address is to be given by the Rt. Hon. Lord Brecon, and Sir Harry Melville will be chairman of the meetings. Part of the Conference will be devoted to considering "mass media" and will include papers on "The Press," by Mr. Percy Cudlipp, on "Films," by Mr. Edgar Anstey, and on "Television," by Dr. T. Margerison. Other papers to be presented are "Technical Information and Industrial Innovation," by Mr. W. S. Robertson; "Communication Network in an Industrial Research Organization," by Dr. R. M. Lodge; "Information—an Educational Problem," by Dr. M. R. Hopkins; "Exhibitions and Conferences," by Mr. E. H. Underwood, O.B.E.; "Technical Liaison Services," by W. Stevens-Wilson; "Using Libraries," by Dr. D. J. Urquhart, and "Summing Up," by Dr. W. L. Francis. During the Conference, there is to be an exhibition of information techniques in the George Hall, when the exhibitors will be the Rubber and Plastics Research Association of Great Britain, Production Engineering Research Association, British Iron and Steel Research Association, Printing, Packaging and Allied Trades Research Association, British Welding Research Association, and the Department of Scientific and Industrial Research itself.

Ergonomics in Industry

Ergomics was the theme of a two-day conference on March 21-22 organized by the Birmingham Productivity Association at the Birmingham Chamber of Commerce. One of the speakers, Dr. S. Griew, lecturer in psychology at Bristol University, said that investigations have been opened by bio-scientists at Cambridge University into the problem of discovering the kind of employment where noise can be a benefit rather than a distraction. Some noise is a stimulant in certain jobs he said. He argued that ergonomics can penetrate problems which even work-study must leave untouched—jobs are becoming less physically stressful and the load imposed on workers is becoming increasingly a mental one. Dr. Griew said Britain was behind such countries as Sweden, Holland, Germany and France in using ergonomics in industry but it is starting to catch up. Noise is only one of the problems now being studied: others are posture, heat stress, vibration, lighting and the layout of equipment.

Anthrax Prevention

Importers of bristles which have to undergo disinfection at the Government Wool Disinfecting Station, Liverpool, will have to pay more for such treatment from April 1. Under the Anthrax Disinfection (Amendment) Rules, 1961, the disinfection fee will be increased by one halfpenny a pound, from 3d. to 3½d. Provision is also included in the new rules for a minimum fixed charge of 7s. 6d. for any one delivery of infected goods disinfected at the Station. The Minister has also increased the fee by one penny a pound for disinfecting bristles sent voluntarily to the Station, from 4½d. to 5½d.

Radioactive Hazards in Industry

Requirements for the protection of workers against ionising radiations and other hazards from radioactive substances are laid down in a statutory draft of Regulations published by the Ministry of Labour last Thursday.

The Ionising Radiations (Sealed Sources) Regulations, 1961* covering "sealed sources" and certain machines and apparatus producing ionising radiations are published in accordance with Section 129 of the Factories Act, 1937. The second preliminary draft of these Regulations (then entitled the Factories (Ionising Radiations) Special Regulations) published in January last year included a general invitation to make comments on the proposed Regulations.

The text now published has been prepared in the light of the numerous observations received and of consultations held with organizations of employers, workers and other interested parties. It has also been considered by an *ad hoc* expert Committee appointed to advise the Chief Inspector of Factories on the subject, by the Advisory Panel on Radiological Problems in Industry and by the General Purposes Committee of the Radioactive Substances Advisory Committee.

The Regulations lay down maximum permissible radiation doses which may be received by employed persons. These are based on the recommendations of the International Committee on Radiological Protection and have received the support of the Medical Research Council. The Regulations provide for reliance to be placed wherever possible on working arrangements that provide intrinsic safety, and for the instruction of workers concerned about the hazards involved and the precautions to be taken. Provision is also made for medical supervision. Any objection to the proposed Regulations by or on behalf of the persons affected should be sent to the Minister of Labour, 8, St. James's Square, S.W.1, by June 9.

* H. M. Stationery Office, price 9d. net.

Mexicans to visit Britain

The Western Hemisphere Exports Council and the Federation of British Industries have jointly invited a party of some 30 Mexican industrialists to visit Britain from April 4 to 18. For each of the visitors a separate and detailed programme has been worked out so that individuals can pursue their own enquiries. They will separate and visit factories throughout the United Kingdom.

While in this country the industrialists will investigate the purchasing of machinery; capital and producer equipment. They will also attempt to arrange licensing agreements and enlist British capital and technical participation in Mexican industry. On the day following their arrival they will be greeted by Sir William McFadzean and Lord Rootes and briefed by their joint host organizations. They will meet representatives of trade associations from industries in which they are interested. After their respective tours they will return to London to attend a luncheon being arranged by the Western Hemisphere Exports Council on April 17 and a reception by Her Majesty's Government at Lancaster House on April 18.

SPEAR & JACKSON, LIMITED—Mr. A. G. Griffiths has been appointed a special director.

Law Cases

£66,500 Theft from SCOW

"Figures of this fradulent scheme . . . amounted to hundreds and hundreds of tons of steel, being stolen, taken away without authority from the premises of the Steel Company of Wales, Limited, and sold to metal merchants. Altogether there was over 1,000 tons of steel involved. Steel is about £45 a ton." Mr. Elwyn Jones, QC, made this submission in opening for the prosecution at Glamorgan Assizes in the case against Richard Hubert Davies (50), a site agent, charged with stealing steel joists and girders from the Port Talbot Works of SCOW and forging and uttering forged repair orders.

Davies pleaded not guilty to nine charges of theft and six charges of aiding and abetting Dillwyn John James, a lorry driver, in forging and uttering forged repair orders. Mr. Jones alleged that Davies and others together succeeded in organizing "a massive system of stealing steel." James was a lorry driver employed by a subcontractor of SCOW and Davies was the top man for his company at the premises.

The method of dishonesty alleged was that the men exploited the means devised by the Steel Company of Wales for supplying contractors with steel. Contractors would need supplies of steel plate for repairs and they would get it from SCOW by means of a repair order. "The way by which the fraudulent scheme was perpetrated was by complete forgery of repair orders—making completely 'phoney' documents," Mr. Jones said.

Earlier, James had pleaded guilty to nine charges of stealing steel and six of forging and uttering forged repair orders. In the absence of the jury James was sentenced to 12 months on all charges, to run concurrently.

Mr. Richard Scott Brunton, manager of the maintenance repair shop at the Abbey Works, said he estimated some 1,480 tons of steel, valued at more than £66,500 were involved.

On the direction of Mr. Justice McNair, the jury acquitted Mr. Davies on nine charges of taking steel from SCOW, three of aiding and abetting another man to forge repair orders, and three charges of aiding and abetting the same man to utter the forgery of repair orders. Mr. Davies was discharged. Edward John Williams, general foreman, who pleaded guilty to one charge of stealing a quantity of steel plate from the Steel Company of Wales, between March 8-9, 1959, was sentenced to 12 months' imprisonment. He asked for three other offences of larceny involving steel plate to be taken into consideration.

The judge said that the prosecution's case against Davies was that a man named James carried out the actual taking away of the steel, but that he did so on the direction of Davies, with his knowledge and by his instructions. The case against Davies depended almost solely on the evidence given by James, who had been dealt with and sentenced on these counts. "James told you that he received his instructions either from Davies or someone else—"Mr. X," who has not been charged. He said that Davies and "Mr. X" seemed to be working independently from each other, so that you cannot tell which of these two men, Davies or "X," was responsible for the offences."

The judge said it might be thought that there was a case of grave suspicion, but the jury would not be entitled to convict a man upon suspicion. From the material put before the court by the prosecution, there was no evidence on which a jury could properly be asked to say that Davies was guilty, he said.

Increases in Capital

TUBE FITTINGS, LIMITED, Old Hill (Staffs), increased by £100 in £1 ordinary shares, beyond the registered capital of £25,000.

TRIPLEX FOUNDRY, LIMITED, Tipton (Staffs), increased by £500,000 in 5s. ordinary shares, beyond the registered capital of £275,000.

HARPER ENGINEERING & ELECTRONICS, LIMITED, London, E.C.2, increased by £500,000 in 1s. ordinary shares, beyond the registered capital of £750,000.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED, London, W.1, increased by £150,000 in 4s. ordinary shares, beyond the registered capital of £650,000.

ACROW (ENGINEERS), LIMITED, London, W.2, increased by £55,075 in 5s. non-voting "A" ordinary shares, beyond the registered capital of £1,300,000.

STANMORE ENGINEERING (DIECASTINGS), LIMITED, Stanmore (Middx), increased by £360,000 in £1 ordinary shares, beyond the registered capital of £60,000.

NORTON INDUSTRIES, LIMITED, founders, engineers, etc., of Wolverhampton, increased by £275,000 in 2s. ordinary shares, beyond the registered capital of £125,000.

HODGE CLEMCO, LIMITED, abrasive blasting machine dealers, etc., of London, E.C.3, increased by £5,000 in £1 ordinary shares, beyond the registered capital of £5,000.

MIDLAND STOCKHOLDERS, LIMITED, iron and steel merchants, etc., of Oldbury (Worcs), increased by £100 in £1 ordinary shares, beyond the registered capital of £5,000.

BONDED BEARINGS, LIMITED, manufacturers and dealers in bearings, gears, etc., of London, S.W.1, increased by £24,900 in £1 shares, beyond the registered capital of £100.

T. F. & J. H. BRAINE (HOLDINGS), LIMITED, ironfounders, etc., of Leeds, increased by £120,000 in 5s. "A" non-voting ordinary shares, beyond the registered capital of £300,000.

BRISTOL PIPING COMPANY, LIMITED, flanged piping and accessories manufacturers, etc., increased by £3,000 in 1s. preferred ordinary shares, beyond the registered capital of £75,050.

TAYLOR & OSBORNE, LIMITED, manufacturers of ferrous and non-ferrous metals, etc., of Birmingham, increased by £20,000 in £1 ordinary shares, beyond the registered capital of £4,000.

CLAVELL BATE & NEPHEWS, LIMITED, packaging machinery manufacturers, etc., of Nelson (Lancs), increased by £12,000 in £1 ordinary shares, beyond the registered capital of £20,000.

KELL & COMPANY, LIMITED, ironfounders, agricultural implement manufacturers, etc., of Gloucester, increased by £12,500 in £1 ordinary shares, beyond the registered capital of £12,500.

FROST & SONS (MOXLEY), LIMITED (formerly Zinc Coatings, Limited), Wednesbury, increased by £499,900, in 53,064 7 per cent. redeemable cumulative preference, 318,384 ordinary, and 128,452 unclassified shares of £1 each, beyond the registered capital of £100.

Diesel Fumes Health Hazard

The dangers to health of highly-toxic materials emitted at street level by motor vehicles, especially diesel vehicles, were stressed by Dr. Reginald C. Webster, Medical Officer of Health for Accrington, at a sessional meeting of the Royal Society of Health at Halifax on March 22. He declared that diesel smoke "delivered under pressure and blasted into young lungs" by motor vehicles was more of a danger to health than smoke from domestic and industrial chimneys.

Dr. Webster said, "I know the Minister of Health says diesel fumes have no effect. I say this is nonsense." Fuel-oil applied to the skin quickly produces dermatitis, he said, and he could not believe diesel oil blasted into the lungs did nothing. "I would like to know the difference in the incidence of bronchitis and cancer in countries where there is no diesel transport," he said. Dr. Webster was commenting on a paper on "Industry in Smoke-controlled Areas," by Mr. Arthur W. Perry, Chief Public Health Inspector at Halifax.

Mr. BERNARD CLARKE, M.B.E., J.P., Lincolnshire divisional general manager, East Midlands Gas Board, since 1957, has been appointed the next Sheriff of Lincoln. He has twice been president of the Institution of Gas Engineers (Eastern Counties) and was Mayor of Stamford in 1947-48.

American Letter

Machine-tool Castings

In the October, 1960, issue of the American journal *Mechanical Engineering*, Professor Melman of Columbia University said that machine-tool builders and their foundrymen suppliers, both in the US and western Europe, required drastic reorganization in methods and structure to improve productivity and costs to meet the Russian challenge of "a new lathe every 15 minutes." (During 1960, US machine-tool builders spent $60 million for castings to make $600 million worth of tools). In a special survey on machine-tool castings published in the December, 1960, issue of *Modern Castings*, Mr. J. H. Schaum, editor, reported the yearly consumption of machine-tool castings as being 160,000 short tons of grey, malleable, and s.-g. iron; 6,000 tons of steel, 1,900 tons of copper-base, and 850 tons of aluminium. These data apply to "cutting" machine-tools which occupy about two-thirds of the output, "forming" machine-tools making up about one-third.

With the US machine-tool industry moving at about 50 per cent. its rate of capacity, it is obvious that a considerable increase in business could be accommodated without much strain upon existing facilities. Statistics compiled for the past ten years show the following:

	Despatches of machine-tools, $ million.	Despatches of forming tools, $ million.
1951	632.2	
1952	1126.0	
1953	1191.2	
1954	891.7	
1955	670.4	295.0
1956	891.0	384.0
1957	878.0	403.0
1958	520.0	200.0
1959	538.0	
1960	650.0	

Prospects

By reflecting upon an alleged 80 per cent. of existing obsolescence and the prospect that tax write-offs through the medium of faster amortization will be allowed by the changed political administration, increasing activity by the US machine-tool industry is hoped for. Speculatively, a business built for a billion-dollar annual turnover, with a 10-year "allowed" depreciation rate, should rebuild itself every decade. However, the reservoir of obsolete equipment indicates that this depreciation rate may be expedient, but not actual.

Better prospects for the machine-tool industry appear to be in the export market which now consumes 20 per cent. of US output. It is quite likely that much of the recent increase has been devoted to world expansion of automobile production, but these developments lead to others of collateral importance. In the under-developed areas of the world, simple machinery adds tremendous progress, the sewing machine being one excellent example. The Committee on Industry and Natural Resources of the United Nations Economic Commission for Asia and the Far East reported, first, the lack of skilled workers and of experienced technical personnel, and second, the absence of capital for investment, as being the greatest impediments to the development of a machine-tool industry throughout Asia. Exclusive of mainland China, regional importations of machine-tools in 1958 were valued at $74,000,000. The report by the United Nations also touches upon the toolmakers' slogan that "it takes tools to make tools" and adds "nearly every article in our civilization is either made on machine-tools or made by machines that are made on machine-tools."

An item published in *Metal Working News* quotes that Russia reports an increase of 5 per cent. in 1960 over 1959 in the production of machine-tools, and mentions that 154,000 units were built in 1960. The uncertainty and lack of classification in the description of what constitutes machine-tools in the Russian statistics makes them difficult to interpret, however. US statistics for 1957 and 1958 indicate that the value (in dollars) were as follow: Machine-tools—1,281,592,000 in 1957, and 654,630,000 in 1958; forming tools—403,245,000 in 1957, and 200,050,000 in 1958. Approximately 225,000 tools were built in the US in 1957 and about 167,000 in 1958. Cutting "tools" for the same two years amounted to 112,695 in 1957 and 153,359 in 1958. Table 1 gives the numbers and types of cutting tools produced in 1957 and 1958.

TABLE 1.—*"Cutting" Machine-tools Produced in US.*

	1957.	1958.
Lathes	16,971	24,561
Grinders	55,227	65,981
Milling tools	11,004	16,558
Shaping tools	495	750
Gear-cutting tools	774	1,536
Boring tools	1,403	2,530
Threading tools	1,502	2,437
Sawing tools	13,561	19,906

The total number of forming tools (for forging, bending, shearing, punching, pressing, etc.) was 54,107 in 1957 and 70,347 in 1958. It is possible that the number of tools manufactured by Russia include both cutting and forming tools as well as simple low-cost tools which lend themselves to relatively easy manufacture on production-line assembly.

Russian Competition

It is in the area of low-cost tools made by mass-production methods that Professor Melman feels that the US and western Europe lack the "key" to improving the well being of the outside world. For example, the following quotations are taken from Professor Melman's report (mentioned earlier in this article):—"On the world machinery market, American-produced machines are typically high-price equipment." "At the present time, the countries of western Europe, owing mainly to lower wages, are able to underbid US machine-tool manufacturers in most world markets." "In the western world, machinery is typically produced in small quantities and by small-quantity methods." "There will be increasing pressure both within the countries of the West as well as in Asia, Africa and South America, to purchase machinery from the lowest-price producer; mass-production items will be cheapest," and the final quote: "The machine-tool industries of the Soviet sphere have been underselling western Europe and the United States."

Machines built in the US are often "tailored" to suit specific needs and are designed for speed, accuracy and automation. These individualistic objectives of machine-tool builders lead to custom-designed jobs having limited susceptibility to mass-production methods and inevitably higher cost. During the first world war, thousands of 6-, 12-, 18- and 24-in. single-purpose lathes and their companion pieces such as drill presses, saws, shapers and millers, were made for the machining of artillery ammunition, etc., and hence were rugged, strong, and accurate enough. However, they lacked the speed, polish, flexibility, versatility and "gadgetry" which make modern machine-tools four

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and five times more expensive. These high-grade machines, as obsolescence overtakes them, would, like used motor-cars, become export items, suitable for the upgrading of machine-tool accomplishments elsewhere. Meanwhile, the experience, facilities and capacity to produce simple or single-purpose machine-tools by production-line methods and in large volume is available and at low cost in the US, Canada, the UK, and needs only the ingredient "money"—or its equivalent in trade—to make it go!

US Foundry Closures

According to the American journal *Foundry*, there were 3,068 grey-iron foundries in the US in 1947 and to-day there are approximately 2,000, producing grey-iron and spheroidal-graphite iron castings. Industrial capacity per year then and now is roughly the same—about 20,000,000 net tons. In 1956, there were 55 foundries closed, 147 in 1957, 151 in 1958, 65 in 1959, and 50 in 1960.

Iron versus Aluminium

The *Cleveland Press*, Cleveland, Ohio, in its issue of January 11, quoted the following remarks by Mr. Victor G. Raviolo, executive director of the engineering and research staff of the Ford Motor Company. Replying to the question: "Ford does not offer an aluminium engine. Other companies do. Why?" Mr. Raviolo said: "A good engine—unlike a small child—should neither be seen nor heard, and our research shows that people care little whether an engine is iron or aluminium. We found aluminium does not improve performance or reduce cost and we will change to aluminium only if we find it superior."

Publications Received

Noble Metal Thermocouples (third edition) by H. E. Bennett, F.I.M., published by Johnson Matthey & Company, Limited, 73-83, Hatton Garden, London E.C.1.

The book describes the development of the noble metal thermocouple, its applications in steelworks, foundries, and glassworks, and methods of calibration. Curves of temperature against e.m.f. are given for many types of couple incorporating alloys of the platinum group metals, and a chapter describes the chief causes of deterioration in service.

A new feature of the present edition is a short section summarising the behaviour of the many thermocouple combinations that have been proposed from time to time, and recommending those most suitable for particular applications. The book is available free to readers on writing to Hatton Garden.

Mechanical World Year Book, 1961. Published by Emmott & Company, Limited, 31, King Street West, Manchester 3; price 5s. net.

This is still a pocketbook, but its contents have been increased to over 500 pages, which makes it rather bulky. Yet quite a proportion of the book is tabular matter of the type likely to be consulted on the shop floor. The concise descriptions of the properties to be expected from the various metals and alloys used in engineering constructions are alike reliable and useful. Moreover they are up-to-date; for instance, in the cast products section, nodular iron and the Nimonic alloys are included. This year-book is a most useful publication to have constantly available

Mechanical World Electrical Year Book, 1961, is published by the same company and costs 4s.* This book also continues to increase in size and now contains about 400 pages. (Although the two books are complementary, both include square roots, log tables and the like.) The revisions on the electrical side have been very extensive and a new section has been incorporated dealing with alarm circuits and kindred matters.

* If bought together with the Mechanical World Year Book, the combined price for both books is 8s. 1d. post free.

Catalogues

Transport Age No. 16. Published by the British Transport Commission, 222, Marylebone Road, London N.W.1; price 2s. 6d.

The character of this splendidly-produced magazine is changing and, by widening its scope, is becoming more interesting. There is less information about the actual railways and much more about the industries they serve. This issue gives illustrated information about the mail-order business, the chemical industry, the wire trade and the manufacture of razor blades. Southampton and Portsmouth have been chosen for a detailed description of activities there and an article entitled "Hebridean Spring" is an excellently-presented tourist article. The magazine is excellent value for half-a-crown.

Furnace Atmospheres. In reprint No. 507, the Incandescent Heat Company, Limited, Cornwall Road, Smethwick, Birmingham, describe a plant which produces from blast-furnace gas a nitrogen/hydrogen gas mixture suitable for use in heat-treatment furnaces, especially for the bright annealing of steel sheet or strip.

Welding Rods and Flux. Four new leaflets have been issued by the Suffolk Iron Foundry (1920), Limited, Stowmarket, Suffolk. They cover stainless-steel-welding wires; fluxes for use when welding cast iron, aluminium and when using bronze-welding rods; silver-solder No. 38, and Super-Silicon No. 9 rods (for fusion welding cast iron).

Resistance-welding Electrode Materials. A well-produced leaflet in colour printing has been received from Johnson, Matthey & Company, Limited, 73-83, Hatton Garden, London, E.C.1, which deals with Mallory electrodes for spot and seam welding. Quite a range of alloys is manufactured for this purpose and the leaflet details their mechanical and physical properties.

pH. Meters. A 14-page brochure devoted to the company's wide range of pH meters and electrode systems has been issued by Electronic Instruments, Limited, Richmond, Surrey. Illustrations and descriptions are given of types for use in the laboratory, industrial and process control, and medical research.

Creep-testing Machines. A four-page leaflet, received from Nash & Thompson, Limited, Tolworth, Surrey, describes and illustrates a range of creep-testing machines, together with the ancillary equipment, furnaces, and extensometers, manufactured by the company.

Electric Furnaces. Leaflet M.1, received from Metalectric Furnaces, Limited, Cornwall Road, Smethwick, covers 18 types of electric furnaces used for a like number of processes. Included is a wide range of both melting and heat-treatment units. The brochure is captioned "Electric Furnaces" and is thus of an introductory character.

Personal

Mr. F. G. VINCENT has been appointed managing director of Cox & Danks, Limited, a member of the Metal Industries group.

Mr. KENNETH ARTHUR OLIVER has been appointed chief metallurgist of the Brightside Foundry & Engineering Company, Limited, Sheffield.

For the past 10 years secretary of Matterson, Limited, Rochdale crane and machine-tool manufacturers, Mr. W. TOMLINSON has been appointed a director of the company.

Mr. H. WILKINSON has been made a technical director of E. A. Roper & Company, Limited, foundry equipment engineers, Keighley. He has been with the company for 20 years.

Mr. ARTHUR AKED, chief checker in the machine-tool drawing-office of William Asquith, Limited, machine-tool makers, of Halifax, has retired after 51 years' service with the company.

At the annual meeting of the Non-Ferrous Club Mr. P. MOULD was elected president; Mr. B. ROBERTS, chairman; Mr. A. H. BRADLEY, secretary; Mr. A. E. TEASDALE, treasurer, and Mr. G. E. LEWIS, Press officer.

Mr. P. D. PINCOTT, director of Erifo, Limited, ironfounders, of Erith, Kent, has recently accepted an invitation to join the Council of Ironfoundry Associations' Recruitment, Training and Education Committee.

Mr. DEREK MORRIS has been appointed general manager of B.S.A. Precision Casting Foundry, Redditch. He joins the group from J. Stone & Company (Charlton), Limited, where he was superintendent of the precision-casting department.

The Rev. BARRY PARKER, a Congregationalist Minister, has been appointed a works chaplain at English Steel Corporation, Limited, where he shares the work with the Rev. MICHAEL JACKSON, the senior chaplain of the Sheffield Industrial Mission.

Mr. R. L. GLAISHER has joined Adrema (Holdings), Limited, Telford Way, London, W.3, as overseas operations manager in charge of the export and merchandising activities initiated by the company to intensify their export drive into new territories and fields.

LORD COHEN OF BIRKENHEAD has been elected president of the National Society for Clean Air. The term of the office is for two years only, and Lord Cohen succeeds Sir HENRY BEAVER, chairman of the Government committee whose report in 1954 led to the passing of the Clean Air Act.

Mr. G. E. LUNT has been appointed a director of John Hill & Sons (Ironfounders), Limited, a member of the Staveley Industries group. He is on the board of the parent company and is managing director of Bradley & Foster, Limited, and its associated companies in the Staveley group.

Mr. EDWARD S. BONSER, 53-year-old managing director of the Wagon Finance Corporation, Limited, Endcliffe Crescent, Sheffield, has been elected chairman of the company. He will combine the office with his present post of managing director of the parent company and of its operating subsidiary, Union Transport Finance, Limited.

Mr. H. W. G. HIGNETT and Mr. JEAN M. DHAVERNAS have been appointed directors of the International Nickel Company (Mond), Limited. Mr. Hignett remains managing director of Henry Wiggin & Company, Limited. Mr. Dhavernas is located in Paris and has been concerned for many years with nickel markets on the Continent.

The Institution of Works Managers, 196, Shaftesbury Avenue, London, W.C.2, have elected as vice-presidents of the Institution: Mr. E. J. HUNTER, chairman of Swan, Hunter & Wigham Richardson, Limited, Mr. J. R. EDWARDS, managing director of the Pressed Steel Company, Limited, and the Hon. GEOFFREY ROOTES, deputy chairman and managing director of Humber, Limited.

Mr. H. J. PENN has been appointed chairman of Murex, Limited, and of Murex Welding Processes, Limited. Mr. F. W. TOMLINSON has become deputy chairman of both companies. Mr. H. C. GREEN has been appointed managing director of Murex, Limited, and Mr. J. M. WILLEY, managing director of Murex Welding Processes. The appointments have been made following the recent death of Sir ARTHUR SMOUT.

United Steel Companies, Limited, announce that Mr. R. G. SMITH has been appointed assistant commercial manager; Mr. C. R. BENNETT, sales manager (heavy products), and Mr. I. E. STEWART, sales manager (light products). In addition, Mr. C. A. GRIFFIN is appointed raw materials officer and Mr. I. W. PETTINGER will succeed Mr. L. E. JACKSON as head of quotation section (heavy products) on the latter's retirement at the end of June.

Mr. ARNOLD P. MANCHANAYAKE, a 22-year-old student from Ceylon, is in this country for training for foundry management. He is spending some time at the Thorncliffe works of Newton Chambers & Company, Limited, and attending classes at Barnsley technical college and Rotherham college of technology. He will be with Newton Chambers for five months, but will afterwards remain in this country for a further four years.

Mr. C. H. M. OWEN, a director of the Staveley Iron & Chemical Company, Limited, and of the Sheepbridge Company, Limited, Chesterfield, retired at the end of last month. Mr. Owen, who joined the Staveley Company as a laboratory assistant in 1913, was appointed chief engineer at Devonshire Works in 1934 and general manager in 1952. He became a director of Staveley Iron & Chemical Company in 1954, and was appointed to the Sheepbridge board a year later.

Mr. ROY S. GOODHIND, principal personnel officer at Newton Chambers & Company, Limited, Thorncliffe, Sheffield, was presented with a camera on March 24 by Mr. P. J. C. Bovill, managing director of the firm, on behalf of the management. Mr. Goodhind, who has taken a senior management post with the Michelin Tyre Company, Limited, at Stoke-on-Trent, has been with Newton Chambers for 10 years and has taken a large part in the success of the Thorncliffe Social and Recreational Association.

The Council of the Combustion Engineering Association has appointed the following to hold office for the year 1961/62: As president, Mr. N. A. MCNEILL, Unilever, Limited; as vice-presidents, Mr. S. P. CHAMBERS, Imperial Chemical Industries, Limited; Sir JOHN CHARRINGTON, Charrington, Gardner, Locket & Company, Limited; Mr. G. D. ELLIOTT, John Thompson (Australia) Pty., Limited; Brigadier K. HARGREAVES, Hargreaves (Leeds), Limited; Mr. H. C. HAWKINS, British Xylonite Company, Limited; Mr. B. E. A. VIGERS, Laporte Industries, Limited, and Mr. F. WILKINSON, National Coal Board. Chairman of the Council is Mr. M. S. GASKILL, of West's Gas Improvement Company, Limited, and hon. treasurer, Mr. E. W. BARNES, Riley (IC), Products, Limited. Brigadier Hargreaves and Mr. F. Wilkinson are new appointments.

News in Brief

CHARLES H. PUGH, LIMITED, Atco Works, Tilton Road, Birmingham, 9, have built a new wing to their factory to house assembly lines for their new 12-in. and 14-in. four-stroke motor-mowers.

TWO PLOTS OF LAND near the works of Hepworth & Grandage, Limited, engineers, at Hirst Wood, Shipley, are to be leased by Shipley Council to the company for seven years for car-parking purposes.

ANOTHER COUNTRY has been entered by the Leyland Motors group, with the sale of two Albion road tankers in the Republic of Liberia. The contract has been placed by African Petroleum Terminals, Limited, of Monrovia.

THE BRITISH MATERIALS HANDLING DIVISION of the Yale & Towne Manufacturing Company held a three-day sales conference at Wolverhampton from March 22 to 24, under the chairmanship of Mr. W. A. Galbraith, sales director.

AN ORDER APPROACHING £100,000 in value for the supply of three 14,700 sq. ft. surface, three-pass, steam condensers and associated equipment, has been received by Richardsons Westgarth (Hartlepool), Limited, through Brown-Boveri, Switzerland.

TO ENABLE SELECTION of the most suitable copying machine for any particular business, a new company, Conroy Copying Consultants, Limited, have opened "The Photo-Copying Machine Centre," at 33, New Cavendish Street, London, W.1.

THE SECOND NATIONAL DIE CASTING EXPOSITION AND CONGRESS will be held in Detroit's Cobo Hall from September 25 to 28, 1962. The sponsors, the Society of Die Casting Engineers (of America), expect the exhibition to attract 150 exhibitors and 7,500 visitors.

PERKINS ENGINES, LIMITED, of Peterborough, have received a "substantial" order for diesel engines for installation in the Russian Volga cars. This is thought to be the first time that Russians have agreed to the fitting of a foreign engine in their cars.

THE CONSTANT GROWTH OF export activity has prompted Opperman Gears, Limited, of Newbury, Berks, to form a new company, L.S.A. (Exports), Limited, a subsidiary of Opperman Gears (Holdings), Limited, which will operate from offices in Hambridge Road, Newbury.

CASTINGS on the way to the Darnall works, Sheffield, of Davy and United Engineering Company, Limited, fell from a lorry at a road roundabout at Manor Top, Sheffield. The firm sent out a lorry with a crane loader to pick up and re-load the castings. No one was hurt.

THIRTY-YEAR SERVICE AWARDS were made to 91 employees of the Stanton Ironworks Company, Limited, near Nottingham, by Sir Frederick Scopes, chairman of the company, at the ninth annual presentation on March 29. One in four of the recipients working in departments that were non-existent 30 years ago. Total number of employees who have qualified for the 30-year award is now 2,120.

AT THE EXHIBITION organized in conjunction with the Institute of Fuel's Conference on "Waste-heat Recovery from Industrial Furnaces," the display of George Kent, Limited, will include electronic recording instrumentation, electrical and mechanical circular-chart recorders, and a rotary-shunt totalizing meter for measurement of air or gas, water or steam. The exhibition is to be held in Bournemouth from May 15 to 19.

A CONTRACT worth more than £3,000,000 for the establishment of a complete 120 tons per day paper mill in Yugoslavia has been awarded the British firm of Millspaugh-Wimpey, Limited, Hammersmith Grove, London. The new mill will be at Plaski in Crotia about 60 miles by road south-east of the port of Rijeka. More than 90 per cent of the equipment for the project will be manufactured in Britain, much of it in Sheffield.

THE 1961 SYDNEY TRADE FAIR, the largest to be held in the southern hemisphere, is virtually sold out. It is to be held from August 1 to 12 on the Royal Agricultural Society's showground on the outskirts of Sydney. Exhibits this year will cover almost every category of consumer and capital goods, ranging from foodstuffs and household goods to precision tools and power equipment. A second Sydney Trade Fair has already been officially announced for 1963.

INDUSTRIAL TRAINING AND THE "BULGE" was the subject of a conference at Leeds College of Technology on March 29, when the principal speaker was Mr. John Hare, Minister of Labour. The chairman was Sir Linton Andrews, and Mr. George H. Lowthian, chairman of the Industrial Training Council, and general secretary of the Amalgamated Union of Building Trade Workers, also spoke. Preparations of industry to deal with the peak number of school-leavers next year were discussed.

AT THE ANNUAL GENERAL MEETING of the Non-Ferrous Club on March 23 at the Queens Hotel, Birmingham, the following were elected to the five places on the committee resulting from the retirement of the existing committee: Mr. A. H. Bradley, McKechnie Bros., Limited; Mr. D. Gibbs, A. D. Keeling & Company, Limited; Mr. K. B. Morley, United Non-Ferrous Metals, Limited; Mr. B. Roberts, M. Joseph & Son (Birmingham), Limited; and Mr. A. E. Teasdale, Martins Bank.

MRS. C. J. HAMPTON, wife of the chairman of C. & J. Hampton, Limited, toolmakers, Sheffield, presented awards to employees with 30 years' service or more at the firm's "Record Club" on March 24. They included Mr. William F. Watts, who received a gold watch and an illuminated address for 50 years' service. Four years ago, his brother Sam, received a similar award. Two other brothers and Sam's son also work with the firm. Two other presentations were made for 30 years' service and four for 20 years.

ENGLISH STEEL CORPORATION'S "A" TEAM won the *Sheffield Telegraph* Cup for the third successive year at the thirteenth annual first-aid competition organized by the Sheffield Area Industrial Group of the Royal Society for the Prevention of Accidents on March 25. The Jessop-Saville team was second, and Yorkshire Engine Company, Limited, third, with Steel-Peech & Tozer fourth. Twenty-four teams from Sheffield, Rotherham, Stocksbridge and Chapeltown took part. The trophy was presented by the Master Cutler, Mr. C. H. T. Williams.

MARKHAM & COMPANY, LIMITED, engineers, Broad Oak Works, Chesterfield, are building a reactor refuelling machine for the Atomic Energy Authority at an estimated cost of £250,000. The machine, which was on view at an "open day" held by the firm on March 21, is to be used for charging and discharging the advanced gas-cooled reactor at Windscale. It is 60-ft. high and weighs 400 tons. It will remove spent fuel elements and replace them with new ones while the reactor is under full load and pressure. Construction has been going on for two years and the machine will be tested at Chesterfield this month before dismantling and conveyance to Windscale.

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GOODYEAR

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Raw Material Markets

Iron and Steel

Overall outputs of iron castings are maintained at substantial levels, although at many establishments a much higher rate of production could be obtained if orders were available. Many of the light foundries, particularly those supplying the domestic utensil trade, are working much below capacity, and although there has been a seasonal improvement much more work is needed to keep these plants fully employed. The light foundries engaged on builders' castings continue to receive good support. The jobbing and textile foundries are fairly well employed, but not to the extent they would like.

The engineering and speciality foundries are, comparatively, the most gainfully employed, and continue to receive a steady flow of business from consumers of high-quality castings. Those engaged chiefly on castings for the motor-car industry have now reverted to a full working week on account of the increased demand from that trade. Many other industries continue to specify freely for high-duty castings, and the foundries supplying these are generally employed.

Apart from the spasmodic arisings of some grades of scrap, the foundries have plentiful supplies of raw materials. The low phosphorus irons, for which demands are now at substantial levels, are supplied without difficulty from the several furnaces now producing this grade. Hematite, which is also used by these foundries in appreciable quantities, is also in good supply and refined irons where required are readily available. No difficulty is experienced by the light, jobbing, textile and some of the engineering foundries which utilize the high-phosphorus irons in covering for their supplies. The present easy supply position of all types of foundry irons does not lend itself to forward buying, of which there is very little. The arisings of scrap keep the foundries supplied with sufficient quantities for consumption needs, but demand for the better and heavier types of cast-iron scrap is larger than the tonnages available. Foundry coke, ganister, limestone, and firebricks are obtained to requirements.

There is little change in the trading position at the re-rollers. Work at present on hand keeps most of the mills fully occupied, although order-books are now on a reduced scale due to lessened demand. Small bars, light sections and strip have recently shown a decline on previous demand, but the heavy call for reinforcing bars and rods is maintained. The position in regard to steel semis remains the same. Most of the re-rollers have good stocks of mild steel billets, etc., and at present there is little demand on home steelworks for supplies. For carbon and alloy steel semis the supply is not so plentiful.

Non-ferrous Metals

The statistical position for tin, always considered good, looked even brighter last week following the news that Malayan production of tin concentrates fell by 11 per cent. in February. Without any restrictions imposed on exports the size of the drop came as a surprise, and accordingly, the three months price for tin metal rose to within less than three points of £830 a ton, the price at which the buffer stock manager can operate in the market to keep prices stable. The outlook continues bright and this is enhanced by the news that the tinplate industry in the US is buying forward for delivery July at around $1.05 a pound.

Copper is weak although the LME price remains steady around £225 a ton. Sporadic bursts of consumer interest from this country and from the Continent have helped sustain the price. However, the settlement of the port strike in Chile and the truce in Laos have made for a weaker market. In the US the same comments apply and the intake price for scrap, after being firm, has come back a ¼ cent to 23¾ cents a pound. The US price of 29 cents a pound is still applicable to custom smelters and producers.

The report of the International Study Group on lead and zinc was a disappointing document and both metals dropped their prices in the market, but recovered the lost ground later in the week. In so far as lead is concerned producers are to aim at a 2 per cent. reduction in supplies. Yet estimates for 1961 indicate that the increase in consumption will be about 3 per cent. The United States has offered to take some of the excess stocks in barter exchange for surplus agricultural products. In any event, the Study Group can only recommend and market observers are not too happy with the vague intentions expressed by producer countries. Meanwhile, the LME price is still around £65 a ton and that in the US at 11 cents a pound.

The Study Group made no recommendations for zinc as the surplus is confined to the United States. The market on both sides of the Atlantic shows a small improvement with the LME quotation around £83 a ton and the US price still called 11½ cents a pound.

Die-casting Discussion Group

The fourth and last of the series of evening discussion meeting being held by the Zinc Alloy Die Casters Association this season took place on March 27 at the Great Western Royal Hotel, London. The meeting, attended by about 100 representatives from member-firms, was chaired by Mr. Reg Turner of Metal Castings, Limited. The subject was vacuum die-casting and the discussion was opened by Mr. H. K. Barton who talked on the various ways of applying vacuum to the die cavity, condensing the paper given at Detroit last autumn.

After the talk the discussion was thrown open, and guestions raised on the practical aspects of vacuum die-casting were answered by Mr. Barton and by Mr. Millard, Mr. Pollock and Mr. Adams of the Sparklets division of the British Oxygen Company, Limited. As at previous meetings, speakers showed themselves very interested in new developments, but not all were convinced of the utility of the process as applied to general commercial casting, though its value in making very large thin castings was undisputed. A further season of similar meetings will be organized by the Association next autumn; details of membership may be had from the Zinc Alloy Die Casters Association, 34, Berkeley Square, London, W.1.

IBF Slough Section Social Evening

As it has proved impossible to make arrangements with the BBC for a visit to television studios, alternative arrangements involving a theatre performance have been made for the annual social evening of the Slough section of the Institute of British Foundrymen. The event will take place on April 29, members (and their ladies) leaving the Community Centre at Farnham Road, Slough, at 4.30 p.m. and proceeding to the Prince of Wales Theatre in the West End of London to see "The World of Susie Wong." Following this, the coach party will proceed to the Great Fosters Hotel at Egham, Surrey, for dinner. Applications for places at the function (price 46s. per head, inclusive of travel) should be made as early as possible to the section secretary, Mr. R. J. Bown, 5, Cape of Good Hope Road, Chalvey, Slough, Bucks. Members' ladies will be welcomed.

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Pig-iron and Steel Production

Statistical Summary of January, 1961 Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table 1 summarizes activities during recent months. Table 2 gives production of steel ingots and castings in January. Table 3, weekly average production of finished steel in December. Table 4 gives the production of pig-iron and ferro-alloys in January, and furnaces in blast. (All figures are weekly averages in thousands of tons).

TABLE 1.—*Iron and Steel Index and General Summary of Pig-iron and Steel Production.*

Period.	B.o.T. Price Index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke sent to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	Iron and steel.	Coal.[1]	Basic materials[2]						Imports.[3]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[4]
1959	340	486	477	286	244	210	242	208	7	388	291	2,244
1960	339	493	482	329	319	264	303	243	24	467	361	2,724
1960—Oct. ..	339	508	472	344	332	273	314	256	17	497	385	2,625
Nov.[5]	339	525	474	344	337	279	315	266	20	505	370	2,686
Dec. ..	339	525	472	325	336	272	306	232	18	451	340	2,724
1961—Jan. ..	339	526	471	351	327	272	308	248	14	478	363	2,792

TABLE 2.—*Average Weekly Production of Steel Ingots and Castings in January.*

District	Open-hearth.		Bessemer. and L.D.	Electric.	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Steel for castings.	
Derbys, Leics, Notts, Northants, and Essex ..	—	4.4	15.2(basic)	2.6	0.1	20.8	1.5	22.3
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Cheshire	1.4	41.0	—	5.8	0.3	47.1	1.4	47.1
Yorkshire (excl. N.-E. Coast and Sheffield) ..								1.4
Lincolnshire	—	48.7	—	—	0.1	48.7	0.1	48.8
North-East Coast	1.0	94.5	—	1.6	0.4	95.4	2.1	97.5
Scotland	1.0	45.1	—	2.4	—	46.8	1.7	48.5
Staffs, Shrops, Worcs, and Warwicks	—	28.6	—	3.8	0.8	31.2	2.0	33.2
South Wales and Monmouthshire	2.3	88.4	18.4(basic)	0.8	0.2	109.6	0.5	110.1
Sheffield (incl. small tonnage in Manchester) ..	8.2	38.8	—	14.6	0.4	59.9	2.1	62.0
North-West Coast	0.1	—	6.5 (acid)	0.9	—	7.3	0.2	7.5
Total	14.0	389.5	40.1	32.5	2.3	466.8	11.6	478.4
December, 1960	12.0	367.0	38.7	31.4	2.0	439.9	11.2	451.1
January, 1960	12.6	386.6	37.9	32.1	2.2	460.2	11.2	471.4

TABLE 3.—*Deliveries of New Non-alloy and Alloy Finished Steel.*

Product.	1959.	1961.	1959.	1960.	
			Dec.[5]	Nov.[5]	Dec.
Non-alloy steel:					
Ingots, blooms, billets and slabs[6]	5.1	5.6	5.1	6.4	5.2
Heavy rails ..	6.8	8.7	6.9	8.4	8.6
Sleepers	0.6	0.8	0.2	0.8	1.0
Fish and soleplates	0.4	0.6	0.4 #	0.6	0.7
Plates, 3 mm. thick and over ..	43.1	52.9	44.8	57.5	57.2
Other heavy prods.	41.2	53.1	48.8	54.8	51.4
Ferro-concrete bars	9.6	12.0	10.0	12.6	11.3
Wire rods	23.5	28.6	25.5	31.6	28.2
Arches, etc. ..	7.8	7.9	6.4	7.8	6.6
Other light sections	33.0	41.3	38.9	45.0	39.7
Bright steel bars ..	7.6	9.7	8.5	9.6	8.3
Hot-rolled strip ..	27.4	33.1	28.7	35.5	29.8
Cold-rolled strip ..	8.0	10.0	8.9	10.6	9.1
Sheets, incl. coated	47.0	53.5	46.9	56.4	46.0
Tinplate	20.9	22.4	22.3	22.5	17.5
Blackplate	0.7	0.9	0.7	1.0	0.7
Tubes up to 16 in.	20.6	23.8	22.1	23.7	22.9
Tube fittings, etc. ..	0.4	0.4	0.4	0.4	0.4
Tyres, wheels, axles	2.4	2.4	2.0	2.4	2.3
Forgings	2.1	2.2	1.9	2.3	2.5
Steel castings ..	3.6	4.3	3.7	4.5	4.6
Tool steel	0.2	0.2	0.2	0.3	0.3
Total	312.0	374.4	333.3	394.7	355.1
Alloy steel	18.2	22.5	19.5	23.6	22.3
Total deliveries from UK prod.[7] ..	330.2	396.9	352.8	418.3	377.4
Add: Imported finished steel ..	7.1	19.1	8.1	10.0	11.2
	337.3	416.0	360.9	428.3	388.6
Deduct: Intra-industry conversion[8] ..	47.6	56.4	49.2	59.7	49.3
Total new material ..	289.7	359.6	311.7	368.6	339.3

TABLE 4.—*Production of Pig-iron and Ferro-alloys.*

District.	Furnaces in blast.	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.
Derbys, Leics, Notts, Northants, and Essex	20	1.6	31.2	17.5	—	50.3
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches	7	—	25.7	—	1.1	26.8
Yorkshire (excl. N.-E. Coast and Sheffield) ..	—	—	—	—	—	—
Lincolnshire	10	—	48.6	—	—	48.6
North-East Coast ..	18	2.6	64.0	—	1.3	67.9
Scotland	7	1.5	23.0	1.6	—	26.1
Staffs, Shrops, Worcs, and Warwicks ..	5	—	10.0	0.9	—	10.9
South Wales and Monmouthshire	10	2.5	51.4	1.0	—	54.9
Sheffield	2	—	3.2	—	—	3.2
North-West Coast ..	8	17.5	—	1.2	1.1	19.8
Total	87	25.7	257.1	22.2	3.5	308.5
December, 1960	86	23.5	256.5	21.7	4.3	306.0
January, 1960	81	22.1	246.6	26.6	2.2	297.5

[1] The index for coal is now based on prices ruling on the last day of each month.

[2] Used in non-food manufacturing industries.

[3] Weekly average of calendar month.

[4] Stocks, mainly ingots and semi-finished, at the end of the year and months shown.

[5] Five weeks, all tables.

[6] Other than for conversion into any other form of finished steel listed.

[7] Includes finished steel produced in the UK from imported ingots and semi finished steel.

[8] Material for conversion into other products also listed in this table.

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For use up to 1800°C

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Current Prices of Iron, Steel, and Non-ferrous Metals

(*Basis prices, delivered unless otherwise stated*)

April 5, 1961

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over Middlesbrough, £21 17s. 0d.; Birmingham, £21 9s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P 10-ton lots or over, £23 5s. 0d., delivered Birmingham £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d. South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si less than 2 per cent, S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over; N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s. 0d.; Birmingham, £25 13s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(*per ton unless otherwise stated, delivered*)

Ferro-Silicon (6-ton lots and over).—45 per cent. Si, £45 0s. 0d. to £48 0s. 0d., scale 15s. 0d. per unit, lumpy, 75 per cent. Si, £62 0s. 0d. to £66 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s.10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £81 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C,* 1s. 9¾d to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free £275 0s. 0d.; 96/98 per cent., £285 0s.0d.

Ferro-columbium.—65/67 per cent. Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £58 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons and over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 100 tons and over, £32 5s. 6d.; hard (0.41 to 0.60 per cent. C), 50 tons and over, £33 17s. 0d.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting, 50 tons and over, £35 4s. 6d. SIEMENS MARTIN ACID (50 tons and over): Up to 0.25 per cent. C, £40 11s. 0d.; silico-manganese, £43 4s. 0d

Billets, Blooms, and Slabs for Forging and for Stamping (50 tons and over).—BASIC: Soft, up to 0.33 per cent. C, £37 0s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £38 2s. 6d.; acid, up to 0.25 per cent. C, £41 14s. 0d.

* Average 68-70 per cent.

FINISHED STEEL

Heavy Plates and Sections (50 tons and over).—Ship plate (N.-E. Coast), £40 7s. 0d.; boiler plates (N.-E. Coast), £42 17s. 0d.; floor plates (N.-E. Coast), £41 16s. 0d.; angles (N.-E. Coast), £38 1s. 6d.; joists (N.-E. Coast), £37 17s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 6d.; under 4 tons to 2 tons, £41 3s. 6d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 11s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £66 7s. 0d.; nickel-chrome, £97 1s. 0d.; nickel-chrome-molybdenum, £109 14s. 0d., in lots of 25 tons and over.

NON-FERROUS METALS

Copper.—Cash, £226 0s. 0d. to £226 5s. 0d.; three months, £227 10s. 0d. to £227 15s. 0d.; settlement, £226 5s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 1½d. per lb. rods, 240s. 6d. per cwt. basis; 20 s.w.g., 275s. 6d. per cwt.

Tin.—Cash, £823 10s. 0d. to £824 10s. 0d.; three months, £826 10s. 0d. to £827 0s. 0d.; settlement, £824 0s. 0d.

Lead (Refined Pig).—First half April, £66 2s. 6d. to £66 5s. 0d.; first half July, £67 2s. 6d. to £67 5s. 0d.; settlement, £66 5s. 0d.

Zinc.—First half April, £84 7s. 6d. to £84 10s. 0d.; first half July, £84 0s. 0d. to £84 5s. 0d.; settlement, £84 10s. 0d

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £122 5s. 0d.; rolled zinc (boiler plates), all English destinations, £121 0s. 0d.; zinc oxide (Red Seal); d/d buyers' premises, £97 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 9⅝d. per lb.; sheets to 10 w.g., 200s. 3d. per cwt.; wire, 2s. 8¼d.; rolled metal, 200s. 3d. per cwt.

Brass (Brazing).—BS1400, B3, £176; B6, £224.

Brass (High Tensile).—BS1400, HTB1, £196; HTB2 £212; HTB3, £229.

Gunmetal.—BS1400, LG2, £220; LG3, £230; G1, ½%, £293; G1, 1%, £283.

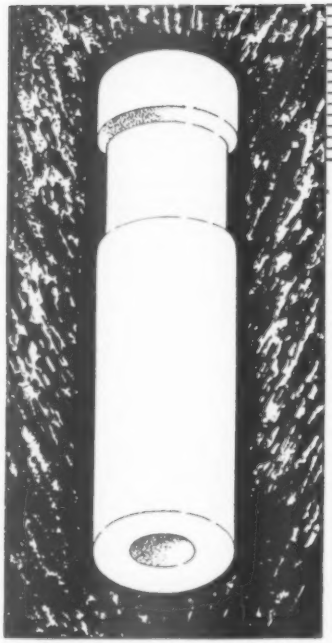
Phosphor Bronze.—BS1400, PB1 (AID released), £309 BS1400, 90/10/1, £297.

Leaded Phosphor Bronze.—BS1400, LPB1, £241.

Phosphor Bronze Strip, etc.—Strip, 287s. 3d. per cwt.; wire, 4s. 1d per lb.; rods, 3s. 3¾d.; tubes, 3s. 3¼d.; chil cast bars, solids 3s. 3¼d.; cored 3s. 4¼d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2¾d. to 2s. 3d. per lb.; Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £69 0s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £244; AB2, £251.



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SITUATIONS WANTED

PRODUCTION CONTROL/PROGRESS MANAGER, young, seeks position, preferably in South. Experienced all aspects progress matters and shop loading. Box RC690, FOUNDRY TRADE JOURNAL.

EXPERIENCED REPRESENTATIVE, ex-foundryman resident in Midlands with extensive connections seeks position with reputable company supplying foundry equipment or materials. Agencies considered. Box ER697, FOUNDRY TRADE JOURNAL.

GENERAL MANAGER seeks position. Twenty-four years senior position. Administration covers: customer contact, sales, estimating, quoting. Sound knowledge production control, bonus system, large and small castings. Sound metallurgical control, blackheart, whiteheart, grey iron steels and non-ferrous. Sand and gravity die casting. Used to large and small companies. Present salary £2,000. Car. Box GM676, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

METALLURGIST, age 30-35, L.I.M. or H.N.C. in metallurgy, required for development work in the preparation of exothermic feeding compounds and fluxes for the foundry trade. Varied and interesting work—five-day week—superannuation scheme.
Reply in confidence to HARBOROUGH CONSTRUCTION COMPANY, LIMITED, Foundry Supplies Division, Harbilt Works, Logan Street, Market Harborough.

TECHNICAL REPRESENTATIVE required for iron and non-ferrous foundry in Hertfordshire. Aged around 30, good technical foundry experience and preferably sales experience. Salary £1,100—£1,200 plus car. Write Box TR695, FOUNDRY TRADE JOURNAL.

FOREMAN PATTERNMAKER

Foreman Patternmaker required to take charge of Pattern Shop attached to Steel Foundry. The Foundry produces castings up to 10 Tons in weight for all branches of the engineering industry by floor and machine moulding. Applicants should be fully conversant with pattern making for this type of work, and should have a sound knowledge of pattern shop administration. Five-day week. Pension Scheme, Canteen facilities.
Applications should be in writing and give full details of education, past experience, etc., to:

The Foundry Manager,
North British Steel Foundry Ltd.,
Balbardie Steel Works,
Bathgate, West Lothian, Scotland

SITUATIONS VACANT—*contd.*

FOREMAN

Required to take charge of a Semi-mechanised non-ferrous Foundry. Applicant must have practical and supervisory experience and be conversant with Core making, Blown and Shell cores, and sand blasting. This is a well paid staff appointment for the selected applicant.

Apply giving age, experience and salary to :—

Personnel Manager, Box No. FM669
Foundry Trade Journal

Advertisers whose announcements appear under a box number are urged to acknowledge, however briefly and informally, all replies received. This particularly applies to advertisements under "Situations Vacant"; serious inconvenience and, sometimes, real hardship can be caused to applicants who receive no indication even of the safe receipt of their communication. Failure to acknowledge replies can also reflect on the good faith of this journal, which is responsible for their onward transmission. If it is desired to maintain anonymity, an acknowledgement on plain paper, quoting the relevant box number, is all that is necessary.

SALES REPRESENTATIVE required by large repetition Iron Founders, North Midlands. Previous experience in engineering or foundry trades essential, good prospects leading to executive position, car provided, pension scheme. Write stating age, experience and salary required. Box SR679, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

TECHNICAL REPRESENTATIVE (Castings) required for London and Home Counties north of the Thames. Experience in similar capacity, or foundry/mechanical engineering background necessary. Write to J. D. S. TOWNSHEND & Co. LTD., Founders' Representatives, 12, South Drive, Banstead, Surrey.

ALUMINIUM Gravity Die Casting Foundry, 20 miles London, requires WORKING FOREMAN. Must be fully experienced in all Light Alloys, able to sample new dies and control labour. Good wages, non-contributory Staff Pension. Housing assistance if required. Apply: THE BUCKS DIE CASTING CO., LTD., Burnham, Bucks. Tel. 40.

CHEMIST and Junior required for laboratory analysis of non-ferrous metals, now S.E.1, later Woolwich. Write GENERAL WORKS MANAGER, A. COHEN & Co. LTD., Rothsay Street, S.E.1.

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The minimum qualification is at least five years' experience selling steel castings of all types and a wide connection in the Industry. A knowledge of Foundry Practice would be desirable.
Applications are invited from candidates 30-40 years old who should be resident in the Area.
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Applications, marked "Confidential," giving details of career, should be sent to the Director, Wolsingham Steel Company Limited, Wolsingham, Bishop Auckland, Co. Durham.

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EXPERIENCED TECHNICAL REPRESENTATIVE

for the MIDLANDS AREA

Successful applicant will have first-class connections with major users of Gravity and Pressure Die-castings and Non-Ferrous Sand Castings, and must be able to negotiate at all levels.

This new appointment offers considerable scope in representing a large, progressive group of Non-Ferrous Foundries.

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Applicants should state age and full details of experience and training, etc. Write in strictest confidence to : The Personnel Manager.

SITUATIONS VACANT—*contd.*

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APPLICATIONS are invited for the post of Assistant Metallurgist for general metallurgical development work on cast materials to cope with the increasing activities of the Company.

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(*a*) High and ultra high tensile steels.
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TECHNICAL REPRESENTATIVE

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Candidates should be between 25 and 35 years of age with a sound general education and a background of pattern-shop and foundry practice.

The position offers good remuneration and excellent opportunities. The Company operates an insurance and pension scheme; travelling and other expenses will be covered and a car provided. Successful applicant will be expected to live within the Greater London area.

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WANTED.—Pin type closing Machine for Shell Moulds. Reynolds or similar make. Sklenar furnace for GM., 200 lb. capacity minimum. Cutting off stone. Table type 12 in. or 14 in. wheel. Box WP675, FOUNDRY TRADE JOURNAL.

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Supplies of finest grade washed and dried Silica Sand wanted by manufacturer in the London Area. Samples and quotations to :—

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Foundry Trade Journal.

MATERIALS WANTED—*contd.*

WANTED

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GRAPHITE-OFFCUTS

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Phone: Eyam 227

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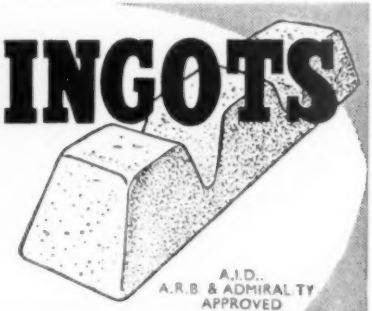

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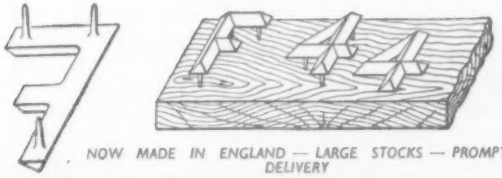

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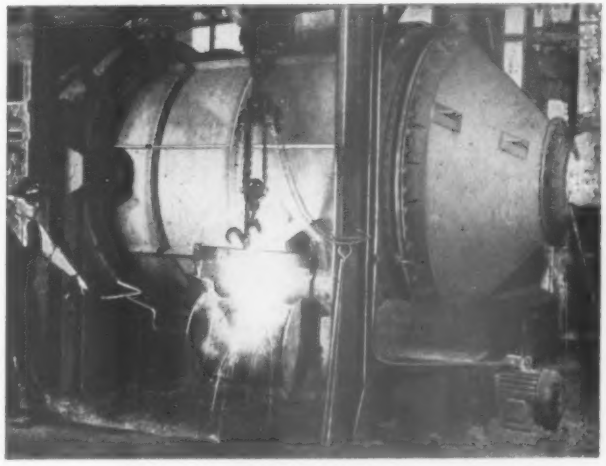

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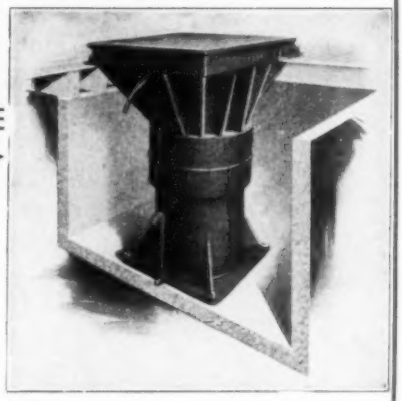

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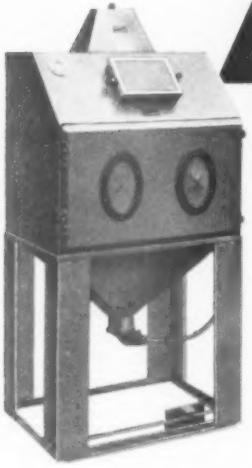

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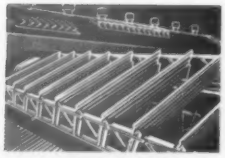

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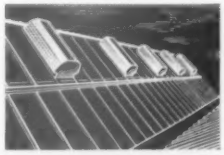

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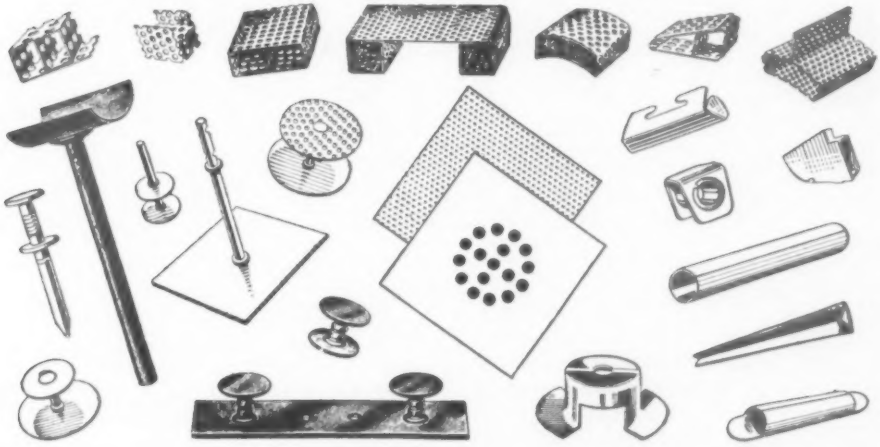

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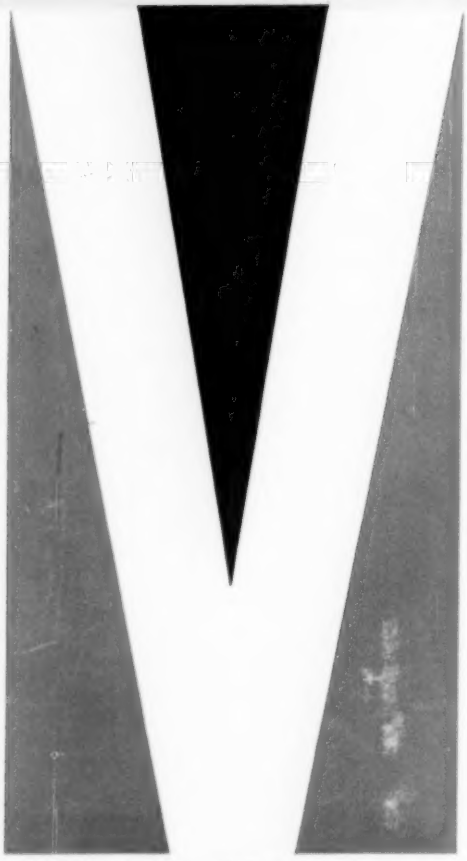

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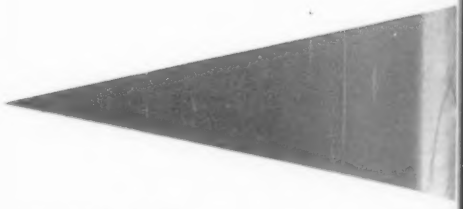

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